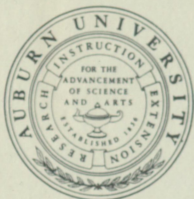


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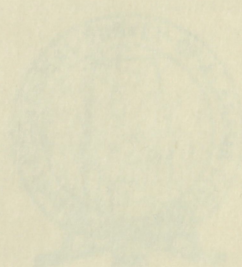
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WASHINGTON

STATISTICS OF THE MINERAL
PRODUCTION OF ALABAMA
FOR 1911

COMPILED FROM REPORTS SUBMITTED TO THE
DEPARTMENT OF COMMERCE

CHAS. A. WATKINS



GEOLOGICAL SURVEY OF ALABAMA

EUGENE ALLEN SMITH, *State Geologist*

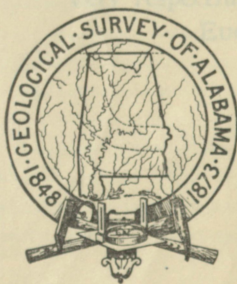
BULLETIN No. 13

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1911

COMPILED FROM MINERAL RESOURCES OF THE
UNITED STATES

By

CHARLES ARTHUR ABELE



UNIVERSITY, ALABAMA

1913

GEOLOGICAL SURVEY OF ALABAMA

EUGENE ALLEN SMITH, State Geologist

BULLETIN No. 13

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PRODUCTION OF ALABAMA
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UNITED STATES
PRESS
BROWN PRINTING CO
MONTGOMERY
ALABAMA

CHARLES FATHER ABLE



UNIVERSITY, ALABAMA

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STATE OF ALABAMA
GEOLOGICAL SURVEY

LETTER OF TRANSMITTAL.

UNIVERSITY, ALA., March, 1913.

HON. EMMET O'NEAL,
Governor of Alabama,
Montgomery, Ala.

SIR:—I have the honor to transmit herewith the manuscript of a Report on the Mineral Production of Alabama for the year 1911, with the request that it be printed as Bulletin No. 13 of the Geological Survey of Alabama.

Very respectfully,

EUGENE A. SMITH,
State Geologist.

GEOLOGICAL CORPS.

Eugene Allen Smith, Ph. D.....	State Geologist
William F. Prouty, Ph. D.....	Chief Assistant
Robert S. Hodges.....	Chemist
Herbert H. Smith.....	Curator of Museum
Roland M. Harper.....	Botanist
George N. Brewer.....	Field Assistant
Charles Arthur Abele.....	
.....	Clerk in charge of Statistics of Mineral Production
James A. Anderson.....	Clerk in charge of Mailing List
A. T. Donoho.....	Stenographer

RIVER GAGE HEIGHT OBSERVERS.

C. J. Stowe.....	Jackson's Gap, Tallapoosa River
J. E. Whitehead.....	Riverside, Coosa River
George Havens.....	Epes, Tombigbee River
W. G. Early.....	Pera, Pea River
S. T. Dillard.....	Beck, Conecuh River

From the records of daily observations of the gage readings at these places when extended through sufficient time, the calculations of available horsepower to be obtained from the different streams is made.

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Alumina, while New York secures at least half of its alumina from the same source. As a product of iron ore for home use.

Manufacturers Record, Feb. 18, 1914.

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PREFACE

PREFACE.

The statistics of all the minerals included in the following pages have been collected in cooperation with the United States Geological Survey, and have been compiled by Mr. Abele from advance chapters of the *Mineral Resources of the United States*, a publication of the Federal Survey.

The introductory and general matter in each of these articles has either been taken without change from the U. S. advance chapters or has been rearranged or condensed from these chapters, or entirely rewritten to suit it for our present purposes. In each case credit is given to the author.

INTRODUCTION.

THE following article by Mr. E. W. PARKER, of the United States Geological Survey, gives a summary of the Mineral Production of Alabama, and brings out the relation which this State holds to other states in the quantity and value of the mineral products of the Nation. *

As Pittsburgh, Pa., is the "Birmingham" of the western hemisphere, so Birmingham, Ala., is the "Pittsburgh" of the Southern States. The occurrence of the iron ores, coking coals, and limestones in close proximity in the vicinity of Birmingham enables that district to produce iron at less cost than any other region of the world. It has followed, therefore, that in years of depression of the iron trade, as in 1911, the ill-effects are exhibited less in Alabama than in other iron-making sections of the country, while in years of plenty Alabama benefits nearly as much as other States. In 1911, for instance, the total percentage of decrease from 1910 in the production of iron ores for the United States was 27.95, while Alabama's output decreased 17.61 per cent. The value of the iron ores produced in the United States in 1911 was 38.59 per cent less than in 1910; the value of Alabama's ores fell off scarcely half as much in proportion, or 19.85 per cent. In 1910, on the other hand, the total increase in the production of iron ores was 11.21 per cent, and Alabama gained 11.11 per cent, while the percentages of increases in value were, respectively, 27.98 and 21.76. Alabama ranks third among the states in the production of iron ores, and fifth in the manufacture of pig-iron, but it must be remembered that the two States, Minnesota and Michigan, which lead Alabama in the production of iron ores, are relatively unimportant in the manufacture of iron, while three of the States (Pennsylvania, Ohio, and Illinois) which exceed it in the quantity and value of pig-iron produced, obtain their ores from the Lake Superior Region, while New York secures at least half of its ores from the same source. As a producer of iron ores for home con-

*Manufacturers' Record, Feb. 13, 1913.

sumption, and as a manufacturer of pig-iron from its own ores, Alabama stands alone.

As a producer of coal, Alabama ranks fifth among all the States, and second in the Southern group. In the quantity of coke made, Alabama and West Virginia are usually in a neck-and-neck race, West Virginia sometimes leading, as in 1910, and Alabama again taking first place, as in 1911. When the value of coke is considered, however, Alabama takes precedence, for although the West Virginia is of better quality, the home markets give to the Alabama operators a marked advantage in the prices obtained for their output. Coal represented 68 per cent of the total of \$28,000,000 worth of mineral products obtained in Alabama in 1911. The value of the iron ores was 17 per cent of the total; the clay working industries added 7 per cent; and the quarry products, principally limestone, lime, and marble, 4.5 per cent. Another 2 per cent is represented by the value of cement produced. Alabama produces a small amount of silver and gold; and other products of minor importance are bauxite, graphite, mica, millstones, mineral waters, natural gas, sand and gravel.

The discrepancy between the above total value and that given in our summary is due to the fact that we have used the value of the pig iron produced, instead of the value of the iron ore mined.—E. A. S.

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1911.

ABRASIVES.

EUGENE A. SMITH.

ALABAMA'S production of abrasives is at present limited to a small number of millstones; but there are several materials in different parts of the state which are sufficiently promising to be worth investigation and thorough testing.

Infusorial or Diatomaceous Earth.—This material is of organic origin, being composed, in part at least, of the siliceous tests or shells of microscopic organisms both animal and vegetable. A diatomaceous earth with considerable admixture of clay and other impurities, occurs abundantly in many localities in the lower part of the State. As, for instance, in the recent swamp deposits near Mobile and in the second bottom deposits of the Alabama River at Montgomery. These are fresh water deposits.

In the Buhrstone and Clayton formations of the Tertiary there are very heavy deposits of diatoms, radiolaria and similar forms of marine origin. The Buhrstone material is a light, somewhat porous substance very high in silica, 86.3 per cent. A somewhat similar material, that is, a light porous substance having much the appearance of flint clay, occurs abundantly at Clayton and other nearby localities in Barbour County.

Polishing powder or Tripoli of very different origin, occurs in many localities in North Alabama. This is a light, porous material known as rotten stone and consisting of finely divided siliceous matter, the result of the thorough leaching of the cherty limestone and dolomite formation of the Lower Silurian and of the Ft. Payne division of the Lower Carboniferous. The Tripoli found in the Knox Dolomite is usually a coherent rock, whilst the sub-Carboniferous material is often a pulverulent substance of pure white color like flour. Both these forms of Tripoli are essentially pure silica or with very slight ad-

mixture of clay. The solid masses need to be crushed, ground and bolted preparatory to using, while the pulverulent form would probably require no manipulation beyond passing through a fine mesh sieve or bolting.

The Knox Dolomite tripoli is most abundant in the Coosa Valley region, especially Calhoun and Talladega counties, while the pulverulent and other material of the Sub-carboniferous is most abundant in the Tennessee Valley, in Lauderdale and Limestone Counties.

A specimen of very white fine powder of 99.4 per cent silica has recently been received from Geneva County. If this deposit should be found of sufficient thickness and easy of access, it should find a market.

Polishing powder or tripoli of very different origin occurs in many localities in North Alabama. This is a light porous material known as rotten stone and consisting of finely divided siliceous matter, the result of the thorough leaching of the cherty limestone and dolomite formation of the Lower Silurian and of the Pre-Payne division of the Lower Carboniferous. The tripoli found in the Knox Dolomite is usually a coherent rock, while the sub-carboniferous material is often a pulverulent substance of pure white color like flour. Both these forms of tripoli are essentially pure silica or with very slight ad-

BAUXITE.

W. C. PHALEN.

USES.

THE chief uses of bauxite were outlined in this report for 1910, as follows: (1) As raw material in the production of metallic aluminum; (2) in the manufacture of aluminum salts; (3) in the manufacture of bauxite bricks; (4) in the manufacture of alundum (fused alumina) for use as an abrasive. The use of bauxite in the manufacture of calcium aluminate to give a quick set to plaster compositions should be added, as well as the extended use which alundum is finding in the refractory industries. The two latter uses are described in detail farther on.

1. The use of bauxite in the production of metallic aluminum is by far the most important of those enumerated above. A large part of the entire output of Arkansas is used in the metallic aluminum industry, and the figures of production from this State have shown phenomenal growth during recent years. A large part of the French product is also used in the manufacture of metallic aluminum.

2. Only the purer bauxite is used in the manufacture of chemicals, such as alum, aluminum sulphate, and aluminum salts in general. Freedom from oxide of iron is essential in the material to be used in the chemical manufactures.

3. The use of bauxite in the manufacture of refractory brick has by no means reached a perfected stage, but it is understood that several manufacturers are now experimenting on processes in which it is admixed with other materials. The life of bauxite-brick linings is as yet undetermined, though it is known to exceed by far the life of silica brick or fire-clay brick. The high cost of raw material, as well as that of its manufacture, makes the ultimate cost of bauxite brick excessive as compared with that of the other two bricks mentioned.

4. Bauxite is used on a large scale in the manufacture of the artificial abrasive, alundum, at Niagara Falls. This abra-

sive is made in the electric furnace by fusing calcined bauxite. It is high in crystalline aluminum oxide, and virtually amounts to a form of artificial corundum. Its quality is under complete control, and hence it can be duplicated with ease in the various abrasive products, a factor of great importance in any successful abrasive industry. Alundum is particularly efficient in the grinding of steel.

New use for alundum.—L. E. Saunders, of the Norton Co., of Niagara Falls, has recently presented data on the value of alundum (electrically fused alumina) as a refractory. Alundum was primarily developed as an abrasive, but its resistance to heat and its other valuable qualities have led to its introduction into the field of the refractories. * * *

Use of bauxite in calcium aluminate.—Henry S. Spackman and E. W. Lazell have taken out a series of patents (Nos. 903017-903020, dated November 3, 1908) on cementitious material and its preparation, in which use is made of the mineral bauxite. The inventions relate more particularly to the preparation of plaster compositions by the incorporation in them of hydraulic calcium aluminate to give them a quick set. Hydraulic calcium aluminate compounds may be prepared by mixing in proper proportions finely ground lime and bauxite or other alumina compounds, such as kaolin or high alumina clays, high alumina slag, etc. Such mixtures may be rendered hydraulic and given a quick initial set when dried, ground, and mixed with water by calcining and sintering them. If desired, the temperature may be carried higher, so as to effect fusion.

PRODUCTION.

The following table gives the production and value of bauxite from 1889 to 1911, inclusive:

Production of bauxite in the United States, 1889-1911, by States, in long tons.

Year	Georgia	Alabama	Arkansas	Total	Value
1889-----	728			728	\$2,366
1890-----	1,844			1,844	6,012
1891-----	3,301	292		3,593	11,675
1892-----	5,110	5,408		10,518	34,183
1893-----	2,415	6,764		9,179	29,507
1894-----	2,050	9,016		11,066	35,813
1895-----	3,756	13,313		17,069	44,009
1896-----	7,313	11,051		18,364	47,338
1897-----	7,507	13,083		20,590	57,652
1898-----				25,149	75,437
1899-----	15,736	14,499	5,045	35,280	125,598
1900-----	19,739		3,445	23,184	89,676
1901-----	18,038		867	18,905	79,914
1902-----	22,677		4,645	27,322	120,366
1903-----	22,374		25,713	48,087	171,306
1904-----	21,913		25,748	47,661	235,704
1905-----	15,173		32,956	48,129	240,292
1906-----	25,065		50,267	75,332	368,311
1907-----				*97,776	480,330
1908-----	14,464		*37,703	52,167	263,968
1909-----	22,227		*106,874	129,101	679,447
1910-----	33,096		*115,836	148,932	716,258
1911-----	30,170		*125,448	155,618	750,649

*Production of Tennessee included.

Production of Bauxite in 1910 and 1911.

	Quantity Tons	Value	Percentage of Total U. S. Production	Percentage of Total U. S. Value
1910-----	9,517	\$38,068	6.39	5.31
1911-----	8,848	35,392	5.68	4.71
Decrease-----	669	2,676	-----	-----
Per cent-----	7.03	7.03	-----	-----

CEMENT.

EUGENE A. SMITH.

PUZZOLAN OR SLAG CEMENT.

DURING the past four years only one establishment in Alabama has been engaged in the manufacture of slag cement, using the material from the furnaces about Birmingham. The production is included in the returns for Portland cement and cannot be given separately.

PORTLAND CEMENT.

Alabama contains large supplies of limestone, chalk, clay and shale well adapted for Portland Cement manufacture, and widely distributed throughout the state. Coal and labor are abundant and cheap, transportation facilities are excellent, and many of the best limestone and chalk localities are situated on navigable rivers, giving ready access and cheap water transportation to Galveston, New Orleans, Mobile, Charleston, and other ports of the Gulf and Atlantic Coasts. This advantage of location will be immensely increased with the opening of the Panama Canal for cement plants located in Alabama will be more than a thousand miles nearer to the Isthmus than their nearest possible competitors.

The limestones and shales of the northern part of the state lie so close to each other, and above all so close to the great coal mines which must supply the fuel, that the establishment of Portland Cement plants near the coal mines would give to this industry in Alabama the same advantages which the proximity of the iron ore, the coal, and the stone has given to the iron industry, and which has placed our state beyond competition.

As a Portland cement mixture, ready for burning, consists approximately of 75 per cent. lime carbonate and 25 per cent. of clayey matter, the material furnishing the lime carbonate is necessarily of more economic importance than that from which the silica and alumina are derived. In consequence, a

Portland cement plant is usually located in the immediate vicinity of a suitable limestone, while the clay or shale required to complete the mixture may be brought some distance.

The limestones formations in North Alabama which can supply the stone adapted for use in cement manufacture are the Trenton or Pelham limestone and the Bangor or Subcarboniferous. In close proximity to both these limestone formations are the shales of the Clinton, Subcarboniferous and Coal Measures.

At the present time there are two cement plants in North Alabama, namely, the Standard Portland Cement Co., located at Leeds in Jefferson County, and the Atlantic & Gulf Portland Cement Co., located at Ragland in St. Clair County. Both of these plants make use of the hard Trenton limestone, and the Standard Cement Co., according to Burchard of the U. S. Geological Survey, uses the shale of the Clinton formation whilst the Ragland Company makes use of the shales of the Coal Measures. Up to the present time no establishment is utilizing the Bangor limestone.

In Middle Alabama the soft, chalky Cretaceous limestone of the Selma Chalk, is the material utilized by the Alabama Portland Cement Co., at Spocari, near Demopolis. The same Company makes use of residual clays overlying and derived from the weathering of the Selma Chalk. During 1911 there was no production reported from the Demopolis plant.

In Southern Alabama the St. Stephens limestone outcropping east and west across the state, furnishes excellent material for Portland Cement manufacture, using either residual clays from decomposition of the limestone, or the clays of the Grand Gulf formation which are almost everywhere in close proximity to the limestone. The Mobile Cement Co. has been for some time engaged in the building of a plant at St. Stephens, but no production has yet been reported.

The following table contains the leading facts relative to the puzzolan-cement industry for the five years 1907 to 1911, inclusive:

Statistics of the puzzolan-cement industry, 1907-1911, by States.

	1907	1908	1909	1910	1911
No. of plants reporting production:					
Alabama -----	1	1	1	1	1
Illinois -----	1				
Kentucky -----	1				
Maryland -----					
New Jersey -----					
New York* -----	1				1
Ohio -----	2	2	2	2	1
Pennsylvania -----	1	1	1	1	1
Total -----	7	4	4	4	4
Production in barrels -----	557,252	151,451	160,646	95,951	93,230
Value of production -----	\$443,998	\$95,468	\$99,453	\$63,286	\$77,786

*Includes production of Collos cement in 1911.

*Production and Value of Cment (Including Puzzolan and Portland)
in Alabama in 1910 and 1911.*

	No. of Producers	Quantity (bbls.)	Value	Percentage of total U. S. value
1910 -----	3	406,214	\$387,600	0.56
1911 -----	3	593,911	529,359	0.79
Increase -----		187,697	141,759	
Percentage increase -----		46.23	36.57	

CLAY AND CLAY PRODUCTS.

JEFFERSON MIDDLETON AND C. A. ABELE.

CLAY.

CLAY available for the manufacture of clay products is one of the most widely spread of our minerals. Clay miners are usually also the manufacturers of the lower-grade clays, but as the higher grades of ware are reached, the rule is that fewer and fewer manufacturers are also miners, until in the highest grades of ware the rule is that the manufacturer is not the miner of the clays that he uses. The figures given in the following tables represent clay that is mined and not manufactured by the miner, but is sold as clay. The clay thus sold is small in quantity compared with that consumed and includes mainly clay used for refractory products.

The total quantity of clay mined in Alabama, and sold as such in 1911 was 35,203 short tons, as compared with 75,082 short tons in 1910, a decrease of 39,879 short tons, or 53.11 per cent. The value of the clay mined in 1911 was \$29,909, a decrease from 1910 of \$8,134, or 21.38 per cent. Fire clay was the only kind of raw clay produced in the state in 1911, and even this was 19,279 short tons short of the 1910 production, which was 54,482 short tons. The decrease in the value of the fire clay was \$2,484, or 7.66 per cent.

Quantity and Value of Clay Produced in 1911.

Kind	Quantity Produced Short Tons	Value	Aver'g. Value per ton	Percentage of Total U. S. value
Fire Clay -----	35,203	\$29,909	\$0.821	0.859

No other variety of clay was produced.

Comparison of Clay Production in 1910 and 1911.

	Fire Clay		Miscellan. Clay		Total	
	Quantity Short Tons	Value	Quantity Short Tons	Value	Quantity Short Tons	Value
1910 -----	54,482	\$32,395	20,600	\$5,650	75,082	\$38,045
1911 -----	35,203	29,909	-----	-----	35,203	29,909
Decrease -----	19,279	2,484	-----	-----	39,879	8,134
Per cent. -----	35.38	7.66	-----	-----	53.11	21.38

No production of Miscellaneous Clay in 1911.

CLAY-WORKING INDUSTRIES.

The total value of the clay products in 1911 was \$1,947,102, an increase over 1910 of \$279,543, or 16.76 per cent. The value of the brick and tile and fire-proof products was \$1,918,606, or 98.53 per cent of the total.

By the above increase in value, Alabama rose in rank from 22nd in 1910, to 17th in 1911. In the production of Brick and Tile alone, the State rose in rank from 19th in 1910, to 17th, in 1911. And by an increase of \$6250 in the value of Pottery produced the State increased its rank, as in Brick and Tile, from 19th in 1910, to 17th in 1911.

Value of Brick and Tile, and Potteries, 1907-1911.

Product	1907	1908	1909	1910	1911
Brick:					
Common—					
Quantity -----	159,315,000	120,237,000	146,180,000	135,785,000	129,694,000
Value -----	\$1,004,644	\$690,963	\$799,693	\$746,961	\$708,903
Average per M.-----	\$6.31	\$5.75	\$5.47	\$5.50	\$5.47
Vitrified—					
Quantity -----	13,362,000	18,248,000	20,444,000	19,772,000	21,444,000
Value -----	\$183,895	\$244,084	\$262,376	\$236,516	\$246,707
Average per M.-----	\$13.76	\$13.38	\$12.83	\$11.96	\$11.51
Front—					
Quantity -----	(a)	(a)	(a)	(a)	9,169,000
Value -----	(a)	a()	(a)	(a)	\$128,403
Average per M.-----	\$13.90	\$17.89	\$16.19	\$15.96	\$14.00
Fancy -----value--	(a)	(a)	(a)	-----	(a)
Fire -----	\$170,711	\$122,354	\$196,887	\$163,672	\$193,375
Drain tile ----- "	(a)	\$2,046	(a)	\$3,773	\$3,777
Sewer pipe ----- "	(a)	(a)	(a)	(a)	(a)
Fireproofing ----- "	(a)	(a)	(a)	(a)	(a)
Pottery:					
Red earthenware "	\$7,530	\$15,058	\$11,886	\$3,475	\$11,243
Stoneware and yellow and Rockingham ware -----value	\$20,215	\$9,031	\$24,453	\$16,371	\$14,753
Miscellaneous ----- "	\$367,414	\$476,070	\$404,832	\$496,791	\$639,941
Total value-----	\$1,754,409	\$1,559,606	\$1,700,127	\$1,667,559	\$1,947,102
Number of operating firms reporting-----	100	103	100	87	82
Rank of State-----	20	19	22	22	17

BRICK AND TILE.

The total number of common brick produced in 1911 was 129,694 thousand (M), a decrease from 1910 of 6,091 thousand, or 4.48 per cent. The value was \$708,903, a decrease of \$38,058 or 5.09 per cent. The value of vitrified brick produced in 1911 was \$246,707, an increase over 1910 of \$10,191, or 4.31 per cent. Common brick was the only brick and tile product whose production fell off in 1911. Vitrified brick, front brick, fire brick, drain tile, and miscellaneous ware all show an increase ranging from 0.10 to 28.9 per cent. Below is a table showing the production and values for 1911, and one showing the relation of the quantities produced, and the values, in 1911 to those of 1910.

The decrease in the common-brick output may be partly accounted for by the increased use of hollow block or tile for the construction of large buildings and even of dwelling houses. This form of construction offers many advantages, among which are economy in construction, the ease and rapidity with which it can be put in the wall, and its nonconductivity. All of these should be factors in the extension of its use. Structures made of hollow tile may be faced either with brick, stucco, or other material. It seems, therefore, likely that the production of common brick will not show rapid increase in the future, and it is probable that the use of hollow tile or block will largely increase.

Production of Brick and Tile in 1911.

Kind	Quantity M.	Value	Averag. Value per M.	Percentage of Total Alabama Brick & Tile	Percentage of Total U. S. Value
Common Brick-----	129,694	\$ 708,903	\$5.47	36.95	1.42
Vitrified Brick-----	21,444	246,707	11.50	12.86	2.46
Front Brick-----	9,169	128,403	14.00	6.69	1.48
Fire Brick-----	11,929	193,375	16.21	10.08	1.33
Drain Tile-----	-----	3,777	-----	.20	0.04
Miscellaneous -----	-----	*637,441	-----	33.22	2.69
Total-----	-----	\$1,918,606	-----	100.00	1.50

*Includes also Fancy Brick, Sewer Pipe, Fireproofing, and Silica Brick.

Production of Brick and Tile in 1910 and 1911.

	1910			1911			Increase or De- crease in Value	Per Cent.
	Quantity M.	Value	Averag. Price	Quantity M.	Value	Averag. Price		
Common Brick---	135,785	\$ 746,961	\$5.50	129,694	\$ 708,903	\$5.47	-\$38,058	- 5.09
Vitrified Brick---	19,772	236,516	11.96	21,444	246,707	11.50	+ 10,191	+ 4.31
Front Brick-----	†	†	-----	9,169	128,403	14.00	+ 4	-----
Fire Brick-----	10,365	163,672	15.75	11,929	193,375	16.21	+ 29,703	+18.14
Drain Tile-----	-----	3,773	-----	-----	3,777	-----	+ 4	+ .10
Miscellaneous -----	-----	494,391	-----	-----	*637,441	-----	+143,050	+28.9
Total--	-----	\$1,645,313	-----	-----	\$1,918,606	-----	+273,293	+16.6

*Includes Fancy Brick, Sewer Pipe, Fireproofing and Silica Brick.

†Included in Miscellaneous.

POTTERIES.

Alabama produces pottery of only the commoner or coarser types, red and yellow earthenware, and most of this is produced for local trade only. The product of the 18 active producing firms was valued at \$28,496, an increase over 1910, of \$6,250, or 28.09 per cent. Below are tables showing the values of the various kinds of the pottery produced in 1911, and also one giving a comparison of the values in 1910 and 1911.

Value of Pottery Products in 1911.

Kind	Value	Percentage of total Alabama Potteries	Percentage of total U. S. value
Red Earthenware-----	\$11,243	39.45+	1.26
Stoneware and Yellow and Rockingham ware	*17,253	60.54+	2.91
Total-----	\$28,496	100.00	0.08

*Includes miscellaneous ware.

Comparison of Pottery in 1910 and 1911.

Kind	1910	1911	Increase or Decrease	Percentage Increase or Decrease
Red Earthenware-----	\$3,475	\$11,243	+\$7,768	+223.54
Stoneware and Yellow and Rockingham ware	*18,771	*17,253	- 1,518	- 8.07
Total-----	\$22,246	\$28,496	+\$6,250	+ 28.09

*Includes miscellaneous ware.

COAL.

E. W. PARKER.

PRODUCTION.

TOTAL production in 1911, 15,021,421 short tons; spot value, \$19,079,949. From the depressed condition of the iron industry in 1911, it was estimated, in a preliminary review published in the closing week of the year, that the coal production of Alabama had decreased about 10 per cent from the high record of 16,111,462 short tons made in 1910. The quantity of coal made into coke, which is immediately affected by the demands of the iron furnaces, did show the marked decrease of 1,288,111 short tons, or 29 per cent, from 4,417,443 tons in 1910 to 3,129,332 tons in 1911. This decrease was in part made up, however, by an increase of approximately 200,000 tons in the production for other purposes and the total decrease amounted to 1,090,041 short tons, or 6.8 per cent. The decrease in value, somewhat less in proportion, was \$1,156,904, or 5.7 per cent, from 20,236,853 to \$19,079,949. The average price per ton advanced from \$1.26 in 1910 to \$1.27 in 1911.

Rank of first ten coal-producing States in 1910 and 1911, with quantity and value of product and percentage of each.

1910.

Production				Value		
Rank	State or Territory	Quantity (short tons).	Percentage of total product 'n	Rank	State or Territory	Percentage of total value
1	Pennsylvania :			1	Pennsylvania :	
	Anthracite -----	84,485,236	16.8		Anthracite -----	\$160,275,302 25.5
	Bituminous -----	150,521,526	30.0		Bituminous -----	153,029,510 24.3
2	West Virginia -----	61,671,019	12.3	2	West Virginia -----	56,665,061 9.0
3	Illinois -----	45,900,246	9.1	3	Illinois -----	52,405,897 8.3
4	Ohio -----	34,209,668	6.8	4	Ohio -----	35,932,288 5.7
5	Indiana -----	18,389,815	3.7	5	Indiana -----	20,813,659 3.3
6	Alabama -----	16,111,462	3.2	6	Alabama -----	20,236,853 3.2
7	Kentucky -----	14,623,319	2.9	7	Colorado -----	17,026,934 2.7
8	Colorado -----	11,973,736	2.4	8	Kentucky -----	14,405,887 2.3
9	Iowa -----	7,928,120	1.6	9	Iowa -----	13,903,913 2.2
10	Wyoming -----	7,533,088	1.5	10	Wyoming -----	11 706,187 1.9

1911.

Production				Value		
Rank	State or Territory	Quantity (short tons).	Percentage of total product 'n	Rank	State or Territory	Percentage of total value
1	Pennsylvania :			1	Pennsylvania :	
	Anthracite -----	90,464,067	18.2		Anthracite -----	\$175,189,392 28.0
	Bituminous -----	144,754,163	29.2		Bituminous -----	146,347,858 23.4
2	West Virginia -----	59,831,580	12.1	2	Illinois -----	59,519,478 9.5
3	Illinois -----	53,679,118	10.8	3	West Virginia -----	53,670,515 8.6
4	Ohio -----	30,759,986	6.2	4	Ohio -----	31,810,123 5.1
5	Alabama -----	15,021,421	3.0	5	Alabama -----	19,079,949 3.0
6	Indiana -----	14,201,355	2.9	6	Indiana -----	15,326,808 2.4
7	Kentucky -----	13,706,839	2.8	7	Colorado -----	14,747,764 2.4
8	Colorado -----	10,157,383	2.0	8	Kentucky -----	13,617,217 2.2
9	Iowa -----	7,331,648	1.5	9	Iowa -----	12,663,507 2.0
10	Virginia -----	6,864,667	1.4	10	Wyoming -----	10,508,863 1.7

GEOLOGICAL SURVEY OF ALABAMA.

Coal production of Alabama in 1910 and 1911, by counties, in short tons.

1910.

County	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke	Total quantity	Total value	Average price per ton	Average number of days active	Average number of employees
Bibb -----	1,462,720	6,961	110,883	-----	1,580,564	\$2,370,919	\$1.50	261	2,666
Etowah -----	169,251	1,538	1,676	-----	172,465	254,798	1.48	251	388
Jefferson -----	4,289,536	109,377	329,777	3,570,012	8,298,702	10,247,456	1.23	255	10,832
St. Clair -----	411,247	2,398	14,764	-----	428,409	571,675	1.33	234	524
Shelby -----	450,324	3,381	34,436	-----	488,141	780,887	1.60	253	847
Tuscaloosa ----	412,144	6,842	54,498	607,735	1,081,219	1,232,495	1.14	264	1,496
Walker -----	3,395,104	66,561	87,118	239,696	3,788,479	4,395,910	1.16	227	4,889
Winston -----	16,192	250	-----	-----	16,442	25,370	1.54	156	57
Other counties*	237,293	8,583	10,855	-----	256,731	356,723	1.39	241	531
Small mines --	-----	310	-----	-----	310	620	2.00	-----	-----
Total----	10,843,811	206,201	644,007	4,417,443	16,111,462	\$20,236,853	\$1.26	249	22,230

1911.

Bibb -----	1,515,976	9,592	107,629	-----	1,633,197	\$ 2,407,918	\$1.47	239	2,631
Blount -----	80,266	1,900	100	-----	82,266	98,599	1.20	225	189
Etowah -----	252,866	720	2,274	-----	255,860	360,307	1.40	189	492
Jefferson -----	4,804,221	86,017	307,265	2,578,887	7,776,390	9,668,726	1.24	246	10,665
St. Clair -----	509,120	1,584	18,507	-----	529,211	673,576	1.27	240	682
Shelby -----	430,505	2,723	29,861	-----	463,089	757,772	1.64	240	866
Tuscaloosa ----	585,666	9,310	61,624	375,058	1,031,658	1,288,235	1.25	265	1,445
Walker -----	2,820,521	25,077	82,610	175,387	3,103,595	3,598,720	1.16	180	5,360
Winston -----	16,074	350	-----	-----	16,424	25,185	1.50	67	129
Other counties† & small mines	120,348	3,918	5,465	-----	129,731	200,911	1.55	170	248
Total----	11,135,563	141,191	615,335	3,129,332	15,021,421	\$19,079,949	\$1.27	227	22,707

*Blount, Cullman, DeKalb, Jackson and Marion.

†Cullman, DeKalb, Jackson and Marion.

In the following table is presented a statement of the production of coal in Alabama, by counties, during the last five years, with increases and decreases in 1911 as compared with 1910:

Coal production of Alabama, 1907-1911, by counties, in short tons.

County	1907	1908	1909	1910	1911	Increase (+) or decrease (-), 1911.
Bibb -----	1,297,158	1,166,548	1,338,243	1,580,564	1,633,197	+ 52,633
Blount -----	} *336,308	*181,062	*186,261	*235,456	*210,070	- 25,386
Cullman -----		8,880	46,194	172,465	255,860	+ 83,395
Etowah -----		205,015	7,176,922	8,298,702	7,776,390	- 522,312
Jefferson -----	7,526,275	5,914,129	354,005	428,409	529,211	+ 100,802
St. Clair -----	283,806	193,434	524,925	488,141	463,089	- 25,052
Shelby -----	245,087	407,547	1,006,989	1,081,219	1,031,658	- 49,561
Tuscaloosa -----	1,047,364	712,101	2,973,776	3,788,479	3,103,595	- 684,884
Walker -----	3,254,919	2,941,836	32,278	16,442	16,424	- 18
Winston -----	35,333	28,408				
Other counties and small mines -----	19,189	50,648	63,857	21,585	1,927	- 19,658
Total -----	14,250,454	11,604,593	13,703,450	16,111,462	15,021,421	- 1,090,041
Total value -----	\$18,405,468	\$14,647,891	\$16,306,236	\$20,236,853	\$19,079,949	- \$1,156,904

*Includes production of Marion County.

So far as known, the earliest record of the existence of coal in Alabama was made in 1834. The first statement of production in the State is contained in the United States census report for 1840, in which year the production is given as 946 tons. The census report for 1850 does not mention any coal production for the State, and the next authentic record is contained in the census statistics of 1860, when Alabama is credited with an output of 10,200 short tons. The mines of Alabama were probably worked to a considerable extent during the Civil War, but there are no records of the actual production until 1870, for which year the United States census reports a production of 11,000 tons. Ten years later the production had increased to 323,972 short tons, but the development of the present great industry really began in 1881 and 1882, when attention was directed to the large iron deposits

near the city of Birmingham, and thus the great "boom" of that city and vicinity was inaugurated. By 1885 the coal production of the State had increased to nearly 2,500,000 tons. Then followed a period of relapse and liquidation, which lasted two years, after which business settled down to a conservative and rational basis and has since developed steadily. In 1902 the coal production of the State reached a total of more than 10,000,000 tons, and reached the maximum of 16,111,462 tons in 1910.

The statistics of production in Alabama from 1840 to the close of 1911 are shown in the following table:

Production of coal in Alabama from 1840 to 1911, in short tons.

Year	Quantity	Year	Quantity	Year	Quantity	Year	Quantity
1840--	946	1859--	9,000	1878--	224,000	1897--	5,893,770
1841--	1,000	1860--	10,200	1879--	280,000	1898--	6,535,283
1842--	1,000	1861--	10,000	1880--	323,972	1899--	7,593,416
1843--	1,200	1862--	12,500	1881--	420,000	1900--	8,394,275
1844--	1,200	1863--	15,000	1882--	896,000	1901--	9,099,052
1845--	1,500	1864--	15,000	1883--	1,568,000	1902--	10,354,570
1846--	1,500	1865--	12,000	1884--	2,240,000	1903--	11,654,324
1847--	2,000	1866--	12,000	1885--	2,492,000	1904--	11,262,046
1848--	2,000	1867--	10,000	1886--	1,800,000	1905--	11,866,069
1849--	2,500	1868--	10,000	1887--	1,950,000	1906--	13,107,963
1850--	2,500	1869--	10,000	1888--	2,900,000	1907--	14,250,454
1851--	3,000	1870--	11,000	1889--	3,572,983	1908--	11,604,593
1852--	3,000	1871--	15,000	1890--	4,090,409	1909--	13,703,450
1853--	4,000	1872--	16,800	1891--	4,759,781	1910--	16,111,462
1854--	4,500	1873--	44,800	1892--	5,529,312	1911--	15,021,421
1855--	6,000	1874--	50,400	1893--	5,136,935		
1856--	6,800	1875--	67,200	1894--	4,397,178	Total	221,175,236
1857--	8,000	1876--	112,000	1895--	5,693,775		
1858--	8,500	1877--	196,000	1896--	5,748,697		

The number of men employed in the coal mines of Alabama in 1911 was 22,707, who worked an average of 227 days, against 22,230 men, for an average of 249 days in 1910. The more working days in 1910 and the larger production in that year were due to the strike in Illinois and other Western States, and to low water in Ohio and Kanawha rivers, which reduced shipments from Pennsylvania and West Virginia to Mississippi River points. The average production per man

in 1911 was 662 tons against 725 tons in 1910. The average daily production per man was 2.92 tons in 1910 and 3 tons in 1911. Most of the Alabama mines are worked 10 hours a day.

Average production per man compared with hours worked per day, and average number of days worked in 1910 and 1911.

Year	8 hours		9 hours		10 hours		All oth'rs	Total	Days Worked	Average Tonnage	
	Mines	Men	Mines	Men	Mines	Men	Men	Men		Per Year	Per Day
1910-----	18	766	36	2,633	134	17,306	1,525	22,230	249	725	2.91
1911-----	15	550	50	5,345	102	12,628	4,184	22,707	227	662	2.92

As in 1910, the coal mines of Alabama in 1911 were practically free from labor troubles, there having been only one instance of disaffection reported. In that case 210 men were idle six days. The supply of labor was adequate, and there was no complaint on account of the lack of transportation facilities.

Statistics of Labor Troubles in 1910 and 1911.

Year	Number of Men on Strike	Percentage of total men working	Total days lost	Average num- ber of days lost per man
1910-----	25	0.11	1,250	50
1911-----	210	0.92	1,260	6

The returns for 1911 show a decrease of 45 in the number of machines employed, 317 having been reported in 1910 and 272 in 1911.

The production by machines decreased from 2,980,122 tons to 2,936,512 tons. The percentage of the machine-mined product to the total increased, however, from 18.5 in 1910 to 19.6 in 1911. In explanation of the decrease in the number of machines employed in 1911 in the coal mines of Alabama and in the quantity of coal mined by their use, there were 3 mines which reported a total of 27 machines in 1910, which were

idle throughout the whole of 1911. Two other properties at which 7 machines were used in 1910 reported no machines used in 1911. One mine which reported 12 pick machines in 1910 used 2 continuous cutters in 1911, and another, which reported 16 machines in 1910, used but 13 in 1911.

Number and kinds of machines in use, and average production per man compared with production by machines, by short tons, in 1910 and 1911.

Year	Pick	Chain Breast	Long-wall	Short-wall	Total	Average Tonnage		Production by Machines	
						Per year	Per day	Total tonnage by machines	% of machined coal to state total
1910 -----	215	82	20	---	317	725	2.91	2,980,122	18.50
1911 -----	184	53	13	22	272	6.62	2.92	2,936,512	19.55
Increase or decr. —	31	29	7	---	45	53	+.01	93,610	
Per cent -----	-14.41	-35.36	-35.00	---	-14.19	-7.31	---	1.46	---

The methods used in the mining of coal were reported by mines having a total production in 1911 of 14,233,483 tons, of which 4,673,719 tons were mined by hand, 2,936,512 tons were mined by machines, and 6,623,252 tons were shot from the solid. The mined coal (that is, the coal undercut by machines, added to that mined by hand) represented 53.5 per cent. of the total, and that shot from the solid, 46.5 per cent. Exclusive of the coal mined by machinery, the percentage of coal shot from the solid was 58.6 and that mined by hand was 41.4 per cent.

Quantity and percentage of bituminous coal produced by different methods in 1911.

Mined by hand	Percentage	Shot off the solid	Percentage	Mined by machines	Percentage	Not reported	Percentage	Total production
4,673,719	31.1	6,623,252	44.1	2,936,512	19.6	787,938	5.2	15,021,421

The quantity of Alabama coal washed in 1911, most of which was used in the manufacture of coke, was 6,251,828 short tons, yielding 5,538,401 tons of cleaned coal and 713,427 tons of refuse.

Quantity and percentage of coal washed, by short tons, in 1910 and 1911.

Year	Quantity of coal washed	Percentage of coal mined	Quantity of clean coal	Refuse	
				Quantity	% of total coal washed
1910 -----	6,772,860	42.03	5,971,305	801,555	11.82
1911 -----	6,251,828	41.61	5,538,401	713,427	11.41
Increase or decrease -----	521,032	-----	432,904	88,128	-----
Per cent -----	7.69	-----	7.09	10.99	-----

According to statistics compiled by the United States Bureau of Mines there were more men killed by explosions, including those from windy shots, in the coal mines of Alabama in 1911 than in any other State, the death roll from this cause in Alabama totaling 130, or more than 30 per cent of all the deaths from this cause. The total number of men killed underground was 204, there being in addition to the 130 deaths from explosion, 47 from falls of roof or coal, 14 from haulage accidents, 5 from explosions of powder, and 8 from other causes. One man was killed by shaft accident and 4 were killed on the surface. The aggregate deaths from accidents above and below ground were 209. The death rate per 1,000 employees was 9.2 and the number of tons mined for each life lost was 71,873.

For a condensed account of the Coal Fields of Alabama, refer to Bulletin 12 of the Geological Survey of Alabama, Statistics of the Mineral Production of Alabama for 1910.

COKE.

E. W. PARKER.

NOTWITHSTANDING the decrease of 487,506 short tons in Alabama's output of coke in 1911 as compared with 1910, the State once more took second place among the coke-producing States, displacing West Virginia, which had held it for six consecutive years. Prior to 1906 the two States were close rivals for that distinction, which alternated almost regularly between them.

Rank of the first five States in production of coke, 1907-1911.

State	1907	1908	1909	1910	1911
Pennsylvania -----	1	1	1	1	1
Alabama -----	3	3	3	3	2
West Virginia -----	2	2	2	2	3
Illinois -----	10	9	5	4	4
Colorado -----	5	5	6	6	5

On account of Alabama's remarkable resources in iron ore, limestone, and coal, and her ability to produce pig iron more cheaply than it can be made anywhere else in the world, the State assumes relatively greater importance in years of depression in the iron trade than when demand is brisk and prices high. The former condition obtained in 1911, and although Alabama's production was less than in 1910, the decrease in iron production and in the manufacture of coke was not so great as in some of the other States. West Virginia, whose coke product has no local outlet, but is sent out of the State to market where it has to compete with cokes from other States, showed a decrease in coke output in 1911 amounting to 1,512,801 short tons, and reducing the total of the State to 2,291,049 tons. The production of Alabama decreased from 3,249,027 tons in 1910 to 2,761,521 in 1911, a loss of 487,506 tons, but exceeding the output of West Virginia by a little over 470,000 tons. The value of Alabama's coke production in 1911 was \$7,593,594, against \$9,165,821 in 1910, a decrease of \$1,572,227, or 17.2 per cent.

*Comparison of Production and Value of Coke in Alabama in
1910 and 1911.*

	No. of Ovens	Coal Charged Short Tons	Coke Produced Short Tons	Total value of coke at ovens	Per cent of total U. S. value
1910 -----	10,132	5,272,322	3,249,027	\$9,165,821	9.19
1911 -----	10,121	4,411,298	2,761,521	7,593,594	9.02
Decrease -----	11	861,024	487,506	1,572,227	-----
Per cent -----	-----	16.33	15.00	17.15	-----

The average price per ton declined from \$2.82 to \$2.75. The average price for West Virginia coke in 1911 was \$1.85 per ton.

Still another comparison may be made between Alabama's coke production and that of West Virginia. It is well known that the average quality of West Virginia's coal exceeds that of Alabama, yet in 1911 the yield of coal in coke in Alabama's operations was 62.6 per cent and in West Virginia 60.4. A part of this difference is undoubtedly due to the fact that in Alabama 340 by-product ovens were in operation in 1911, from which the output amounted to 669,433 short tons of coke, or 24.24 per cent of the total output of the State. In West Virginia there were 120 retort ovens in operation in 1911 and their output was 165,099 short tons of coke, or 7.21 per cent of the total product. The 340 retort ovens in Alabama consisted of 240 Semet-Solvay ovens at Ensley and 40 at Tuscaloosa, which have been in operation for several years and 60 Koppers ovens, completed during 1911 by the Woodward Iron Co., at Woodward. An additional plant of 280 Koppers ovens was under construction at the close of 1911 at Corey for the Tennessee Coal, Iron & Railroad Co. This was the only new construction work in progress at the end of the year. There were 44 establishments in Alabama in 1911—an increase of 1 over 1910. The number of ovens in existence at the close of 1911 was 10,121, a decrease of 11 as compared with 1910, for whereas 60 retort ovens were added to the equipment in 1911, 71 beehive ovens were abandoned. Of the 44 establishments in Alabama in 1911, 14, with a total of 2,474 ovens, were idle throughout the year. In addition to these there

were 330 ovens, portions of other establishments, which were idle during the entire year. The number of active ovens was therefore 7,317, and the average production from them in 1911 was 377 short tons, against 9,614 active ovens in 1910, with an average production per oven of 338 tons.

The principal coal beds of Alabama which furnish the coal for coke making are the Pratt, the Mary Lee, and the Blue Creek, all of which are in the Warrior Basin, and the mining operations are in Jefferson, Walker and Tuscaloosa counties. Some coking coal is also produced from the Buck or Blocton No. 1 bed, in Bibb County.

Statistics of the manufacture of coke in Alabama, 1880-1911.

Year	Establish- ments	Ovens		Coal used (short tons)	Coke produced (short tons)	Total value of coke at ovens	Value of coke at ovens per ton	Yield of coal in coke (per cent.)
		Built	Building					
1880-----	4	316	100	106,283	60,781	\$ 183,063	\$3.01	57.0
1890-----	20	4,805	371	1,809,964	1,072,942	2,589,447	2.41	59.0
1900-----	30	6,529	690	3,582,547	2,110,837	5,629,423	2.67	58.9
1907-----	43	9,889	50	4,973,296	3,021,794	9,216,194	3.05	61.0
1908-----	45	10,103	0	3,875,791	2,362,666	7,169,901	3.04	61.0
1909-----	43	10,061	0	5,080,764	3,085,824	8,068,267	2.61	60.7
1910-----	43	10,132	340	5,272,322	3,249,027	9,165,821	2.82	61.6
1911-----	44	*10,121	†280	4,411,298	2,761,521	7,593,594	2.75	62.6

*Includes 280 Smet-Solvay and 60 Koppers ovens.

†Koppers by-product ovens.

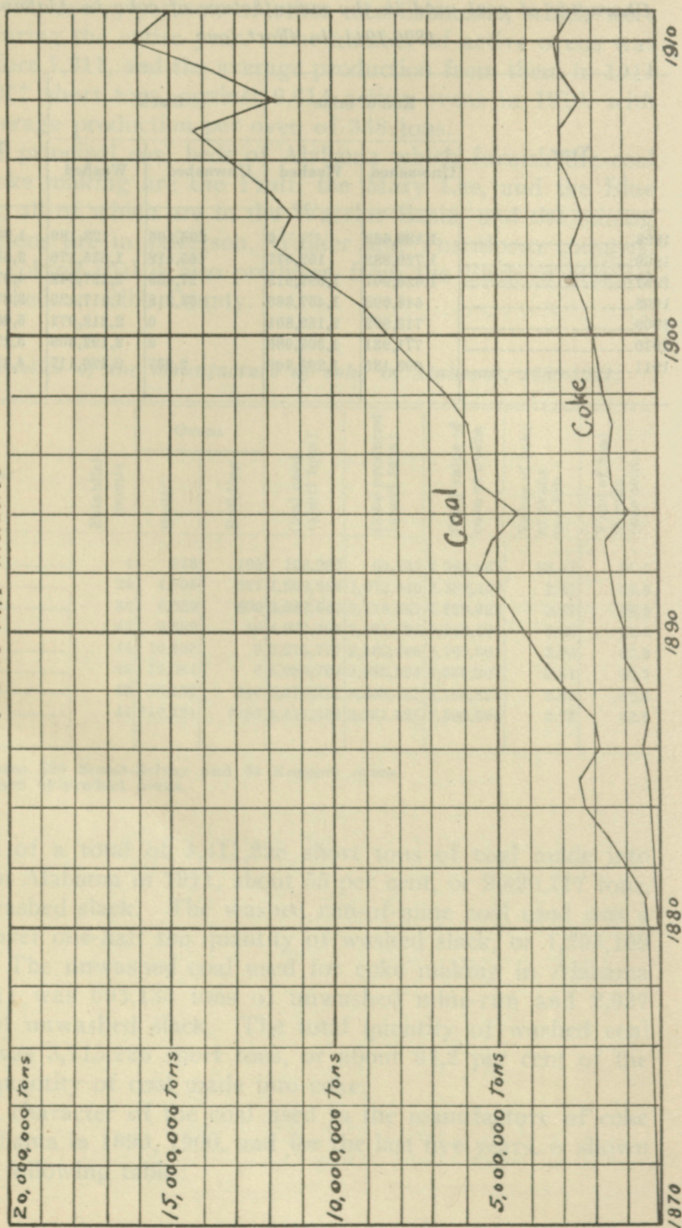
Out of a total of 4,411,298 short tons of coal made into coke in Alabama in 1911, about 55 per cent, or 2,420,117 tons, was washed slack. The washed run-of-mine coal used was a little over one-half the quantity of washed slack, or 1,295,109 tons. The unwashed coal used for coke making in Alabama in 1911 was 693,135 tons of unwashed mine-run and 2,937 tons of unwashed slack. The total quantity of washed coal used was 3,715,226 short tons, or about 84.2 per cent of the total quantity of coal made into coke.

The character of the coal used in the manufacture of coke in Alabama in 1890, 1900, and for the last five years, is shown in the following table:

*Character of coal used in the manufacture of coke in Alabama,
1890-1911, in short tons.*

Year	Run of mine		Slack		Total
	Unwashed	Washed	Unwashed	Washed	
1890-----	1,480,669	0	206,106	123,189	1,809,964
1900-----	1,729,882	152,077	165,418	1,535,170	3,582,547
1907-----	1,020,907	1,697,913	27,433	2,227,043	4,973,296
1908-----	548,093	1,457,360	53,218	1,817,120	3,875,791
1909-----	713,992	2,153,801	0	2,212,971	5,080,764
1910-----	771,931	1,308,085	0	3,192,306	5,272,322
1911-----	693,135	1,295,109	2,937	2,420,117	4,411,298

Curves showing the production of Coal and Coke, by tons, in Alabama from 1876 to 1911 inclusive



GOLD AND SILVER.

H. D. M'CASKEY.

THE mine production of gold in Alabama in 1911 was 915.06 fine ounces, valued at \$18,916, and of silver, 171 fine ounces, valued at \$91, against 1,622.16 fine ounces of gold, valued at \$33,533, and 268 fine ounces of silver, valued at \$145, in 1910. The value of the output decreased in 1911 therefore by \$14,617 in gold and \$54 in silver. The silver production is from recovery of this metal in refining the gold. No copper output and no placer production were reported from Alabama in 1911.

The mine production of Alabama in 1911 was from 6,360 short tons of siliceous ore with an average recovered value per ton in gold and silver of \$2.99, against 9,763 tons averaging \$3.41 in 1910 and 9,886 tons averaging \$2.96 in 1909.

The output of 1911 was again mainly from the Hog Mountain mines in Tallapoosa County. The siliceous ores of this mine are in part oxidized and in part sulphides and they are treated in a 120-ton cyanide plant. No operations were reported at the Gold Ridge properties in Randolph County. At the Story prospect a small tonnage was treated in a 5-stamp amalgamation mill. The vein is in oxidized ore and is opened by an adit 150 feet long and a 75-foot shaft. Small trial shipments of gold ore only were made from the Holley prospect near Dadeville in Tallapoosa County.

Gold and Silver production in 1910 and 1911.

	Gold		Silver	
	Quantity oz.	Value	Quantity oz.	Value
1910 -----	1,622.16	\$33,533	268	\$145
1911 -----	915.06	18,916	171	91
Decrease -----	707.10	14,617	97	54
Per cent -----	43.59	43.59	36.19	37.24

GRAPHITE.

E. S. BASTIN.

GRAPHITE is widely distributed among the metamorphic rocks of Alabama, in which it occurs in two forms: (1) In the feebly crystalline schists which have been called Talladega slates, and which in part at least are Paleozoic sediments of as late age as the "Coal Measures," graphite is often found as a graphitic clay free from grit. In this condition the graphite is difficult to separate from the other matter with which it is mixed, and the material has not as yet been utilized to any important extent. Examples of this mode of occurrence may be seen near Millerville, in Clay County, and about Blue Hill, in Tallapoosa County. (2) In the mica schists and other highly crystalline rocks, graphite is found in the form of thin crystalline flakes which may be separated from the associated minerals. Graphitic schists of this type are now being worked in three localities, and have in the past been worked at several others.

The more important localities where flake graphite occurs, including the two mines from which the 1911 production was obtained, are described briefly below.

CLAY COUNTY.

The two properties which are at present the leading producers in Alabama are located $4\frac{1}{2}$ and 8 miles west of Ashland. Ashland, the shipping point, is the terminus of a short branch of the Atlanta, Birmingham & Atlantic Railroad. This branch is 7 miles long, and joins the main line at Pyriton. The freight rate on refined graphite from Ashland to New York City is about \$7 per ton.

Allen Graphite Co.—The quarry and mill of this company, which was the largest producer in 1910, but which operated only three months in 1911, are located a little over 8 miles west of Ashland, at a settlement shown on the United States Geological Survey's map of the Ashland quadrangle under the name "Graphite." The mine is about one-half mile from

the mill, with which it is connected by a tramway. The concentrate is hauled over a fairly good road to Ashland for shipment. The mining is entirely from open pits, and because of the decomposed character of the rock can be accomplished largely with the aid of pick, shovel, and crowbar, without much drilling and blasting. The main pit is about 450 feet in length, 100 feet in average width, and about 60 feet in maximum depth. A small pit just east of the main pit and on the same graphitic band is about 100 feet long, 90 feet wide, and 25 feet deep. A third pit has been opened on the same band of graphitic schist about 1000 feet east of the main pit on the west face of another hill. This is about 90 feet wide, about 200 feet long, and about 40 feet deep. The strike of the schist at the north end of the main pit is N. 80° E., with a dip of 75° S. This is fairly typical for the deposit as a whole.

The rock mined is highly schistose, and is composed largely of quartz and graphite. A white fibrous mineral, probably sillimanite, is also abundant. Feldspar and mica are rare. Few of the thin graphite flakes so far seen by the writer exceed 2 millimeters across, and most of them were under 1½ millimeters. They are arranged subparallel to one another, and to this arrangement and a similar orientation of the sillimanite (?) prisms is largely due the schistosity of the rock. At the west end of the main pit a dike of coarse granite, 1 to 1½ feet wide, parallels the foliation of the schist, and in the easternmost pit the graphitic schist has also been intruded by an irregular body of coarse granite pegmatite carrying muscovite crystals up to 3 inches across. The graphitic beds here are also disturbed by faulting. The contact metamorphic effects of these small intrusions on the graphitic schist appear to be slight.

The milling process is divided into three principal stages: (1) Crushing and drying; (2) preliminary wet concentration; and (3) final dry concentration.

The most important step in the milling process is the preliminary concentration by water flotation. In these concentrators the dry crushed rock is spread in a thin stream upon the surface of slowly flowing water. The graphite being flaky is supported by the surface tension of the water and floats off, while the granular gangue, mainly quartz, sinks and is sent

to the dump. The process is cheap where water is plentiful. The tailings seen on the dump carry surprisingly little graphite; that which is present is usually attached to other minerals. Much fine grit of course floats off with the graphite, but is removed in the final dry concentration.

The crude rock is said by the operators to average about 5 per cent graphite. The finished product averages about 2.75 per cent by weight of the crude rock treated. Four principal grades are produced, whose relative proportions are about as follows:

*Grades of Flake Graphite Produced by the Allen Graphite Co.,
Clay County, Ala.*

	Per Cent.
Grade C. Crucible flake.....	36
Grade 1. Lubricating flake (coarse).....	11
Grade 2. Lubricating flake (fine).....	18
Grade D. Dust for foundry facings, etc.....	35
	100

The highest grade contains over 90 per cent graphite; the dust averages about 50 per cent graphite. The prevailing average prices f. o. b. New York are: Grade C, 6½ cents per pound; grade 1, 5½ cents per pound; grade 2, 4½ cents per pound; and grade D, 1 cent per pound.

Ashland Graphite Co.—The quarry and mill of this company, which is the successor of the Enitachopco Graphite Co., are located 4½ miles west of Ashland. The product of the plant is hauled by teams to Ashland. The workings of this property consist of two open pits located in the same bed of graphite schist. The two pits are on neighboring knolls, and the mill is in the small valley between them. The largest or eastern pit is about 400 feet long, 30 to 50 feet wide, and 50 feet deep. It follows along the strike of a band of graphitic schist which averages about 30 feet in width, though broadening locally to about 50 feet. The strike is about N. 55° E., and the average dip is about 45° S. E. The second pit, located west of the mill, is about 150 feet long, 20 feet wide, and about 20 feet deep. The trend of the schists is similar to that at the larger pit.

The graphitic rock at this quarry is similar in general to that at the Allen quarry. The schist is too much decomposed for complete identification of all the minerals, but quartz is the principal component. As a rule mica is rare, but the brown mica, biotite, is common in a few places. The graphite forms thin flakes, mostly under 1 millimeter in diameter, although some reach 2 millimeters. No igneous rocks are found in association with the graphitic schist at this property. The rock being more or less decomposed, can be excavated with pick and crow-bar, with occasional blasting. It is loaded into trams and hauled to the mill.

The mill has a capacity of about 50 to 60 tons per day of 12 hours. The milling process is in general similar to that at the Allen mill, though differing in details. A dry pan is used in preliminary crushing. The water flotation separators are similar to those at the Allen plant. The final dry concentration is accomplished by screens and burrstone mills, without the use of Hooper pneumatic concentrators.

CHILTON COUNTY.

Flaketown Graphite Co.—This company operates a quarry and mill in the valley of Chestnut Creek, about $3\frac{1}{2}$ miles northeast of Mountain Creek station. The graphitic rocks lie in the west valley slope, and have been developed by a small open pit. South of this pit sufficient prospecting has been done to show that the deposit is of considerable size. The rock is a graphitic quartz schist very similar to those worked in Clay County. On account of its situation on a steep valley slope, which favors relatively rapid removal of weathered material, the remaining material is not so much decomposed as the deposits west of Ashland, in Clay County.

Small quantities of green micaceous material, probably muscovite, are present in some specimens, but in general, mica is rare. The strike of the schist folia at the main pit is N. 35° W., with a dip of 45° SW. A few hundred yards farther south the strike shifts to N. 20° W. and N. 15° W. A dike of granite pegmatite 1 foot wide intrudes the graphitic schist at the main pit. It parallels the foliation, and within 1 to 2 inches of

the schist, carries graphite in scattered flakes up to one-eighth of an inch in diameter.

An analysis made by the United States Geological Survey of a composite sample of graphitic schist, collected from a number of different exposures on this property, showed 4.63 per cent. of graphite. The mill is located at the quarry, and during part of the year electric power for its operation is generated by water power from a 20-foot dam on Chestnut creek. Auxiliary steam power is also installed. Very little material has yet been marketed, the plant being still in an experimental stage. Mountain Creek is the nearest shipping point.

This plant reported no production in either 1910 or 1911.

COOSA COUNTY.

A graphite deposit is located about 2 miles northwest of Goodwater, a station on the Central of Georgia Railway. At this locality a large number of small prospect pits are scattered over an area of several acres, and nearly all show graphite quartz schist. The prospects are on a steep southwest hillside overlooking the iron bridge where the wagon road from Goodwater to Pine Grove crosses Hatchet Creek. The rock is gray when fresh, and highly schistose, and strikes nearly east and west, with a dip of about 45° S. It is almost identical in character with the graphitic schist worked in Clay County, and consists largely of quartz and graphite, the latter in flakes mostly under 1 millimeter in diameter. Very little mica is present. An analysis of a composite sample of graphitic schist collected from a large number of pits on this property showed 2 per cent of graphite, but in certain portions the percentage will undoubtedly be greater. The deposit is unquestionably a large one, and its situation on a steep hillside would afford opportunity to work to a considerable depth by open pit methods. The neighboring Hatchet Creek would furnish abundant water for wet concentration of the graphite.

A second deposit, probably of similar character, has been prospected between Mount Olive and Hollins, and is said to be of considerable size.

The foregoing description is from "Mineral Resources of the United States, 1910."

PRODUCTION.

The Alabama production, as usual, was all of the crystalline variety. There was a notable decrease in production as compared with 1910, because the Allen Graphite Co., of Quenelda, only operated for the first three months of the year. The mine and mill of this company were taken over during the year by persons associated with the American Flake Graphite Co., of Pennsylvania, and will be operated under the name of the Quenelda Graphite Co. The Ashland Graphite Co., of Ashland, is also undergoing reorganization and a new mill is in process of erection.

Production of Graphite in 1910 and 1911.

	Quantity Lbs.	Value	Percentage of Total U. S. Quantity	Percentage of Total U. S. Value
1910 -----	1,577,977	\$54,688	2.03	14.49
1911 -----	820,000	39,000	1.40	13.51
Decrease -----	757,977	15,688	-----	-----
Per cent -----	48.43	28.67	-----	-----

IRON ORE.

EUGENE A. SMITH.

IRON ores of Alabama in the order of their economic importance are (1) red ore or hematite; (2) the brown ore or limonite; (3) the gray ore. The black band and clay iron stone have been noticed as occurring in a number of places, but only the red ore and the brown ore have been mined on any large scale.

Practically all the ore mined in Alabama is smelted in the State, the shipments out of the State being about equal to those received from other states.

The tables given below will show the rank of Alabama among the States of the Union both in the production of iron ore and in pig iron, and will show also the quantity of iron produced by charcoal and by coke respectively as fuel.

RED ORE OR HEMATITE.

Practically all the ore of this quality mined in Alabama occurs in the Clinton or Red Mountain formation. The Red Mountain ridges occur on each side of the anticlinal valleys which separate the coal fields. In places the red ore ridges are lacking on one side, usually the western, of the valleys being cut out by faults, while on the other hand the ridge may be duplicated on one side of the valley by the same faults.

In most of the valley occurrences the moderate dips of the ore bed are on the eastern side and there are also practically all of the ore mines. Murphrees Valley makes an exception to this, the moderate dips and the iron mines being on the western side. The iron ore occurs mainly in the central part of the formation in seams or beds one to five in number, which vary in thickness from a few inches to thirty feet.

While the ore seams are very persistent along the outcrop which in Alabama must be as much as 50 miles, yet they vary greatly from place to place, being either too thin or too lean for profitable working in the greater part of this distance.

The most important development of the Clinton ore in this State and in the world is along the 15 or 16 mile stretch of

the east Red Mountain between Birmingham and Bessemer, and there is a practically continuous series of mines and stripings for this entire distance. Much mining of this ore has also been done near Gate City, Village Springs, Attalla, Gadsden, Round Mountain, Gaylesville, Ft. Payne, Valley Head, etc.

Production and Value of Hematite in Alabama in 1910 and 1911.

	Quantity Tons	% of total U. S. Prod.	Value	% of total U. S. value
1910 -----	3,678,139	7.12	\$4,376,555	3.39
1911 -----	3,119,696	8.43	3,646,925	4.65
Decrease -----	558,443	-----	729,630	-----
Per cent -----	15.18	-----	16.67	-----

The average price per long ton of hematite in Alabama in 1910 was \$1.19; in 1911, \$1.17.

BROWN ORE OR LIMONITE.

This ore, the second in importance in the State and in the United States, furnished only 4.63 per cent of the total iron ore production of the United States in 1911. Of this Alabama produced 43.96 per cent, 835,886 long tons, and the State holds the *first* rank in this industry.

In the early days of iron making and up to the year 1876 this was the only ore used in the catalan forges, bloomaries, and charcoal furnaces of the State. It was then demonstrated that good iron could be made at low cost from the red ores, with coke for the fuel.

In general the limonites are considered the best of the ores of Alabama and they command the highest prices and command a ready sale.

The usual mode of occurrence is in irregular masses of concretionary origin in the residual clays resulting from the decomposition of limestones, and as a consequence the mining is uncertain and expensive. Limonite also occurs in regularly stratified seams or beds, and then it is the result of the alteration of pyrites or of carbonate ores. Practically all of the

brown ore actually mined is that occurring in the residual clays above mentioned. Most of the ore before going to the furnace is washed and screened, and this manipulation, together with the cost of mining, makes it the most expensive of the iron ores, and it is therefore seldom used alone, but is usually mixed with the red ore in proportions determined by the quality of the iron desired. It is used alone in the charcoal furnaces and also in the coke furnaces when a particularly tough pig iron is wanted.

The limonite deposits are very numerous and are distributed over a broad expanse of country and in many places are known to be very extensive. In some of the deposits ore is in nearly solid mass, in others it is much scattered, and in consequence the amount of foreign material necessary to be moved for every ton of ore produced, varies very much, not only in the different ore banks but also in the different parts of the same bank.

The deposits occur in nearly all the geological formations of the state, but in most of these the ore is either insufficient in quantity or not pure enough to be of much commercial value. The most important of the deposits, in point of extent and value, occur overlying the following formations, viz., the Knox Dolomite and the Weisner Quartzite, the Lauderdale Chert of the Lower Carboniferous, and the Lafayette. Some extensive beds of ore of inferior quality generally, occur also in the Tuscaloosa formation of the Cretaceous, and in the upper part of the Lower Carboniferous and in the Metamorphic rocks.

The average price per long ton of limonite ore in Alabama in 1910 was \$1.53; in 1911, \$1.47.

Production and Value of Brown Ore in Alabama in 1910 and 1911.

	Quantity	% of total U. S. Prod.	Value	% of total U. S. value
1910 -----	1,123,136	39.15	\$1,707,167	35.28
1911 -----	835,886	43.96	1,229,181	39.18
Decrease -----	287,250	-----	477,086	-----
Per cent -----	25.57	-----	27.94	-----

Production of Iron Ore in Alabama in 1910 and 1911.

	Hematite (Long Tons)	Brown Ore (Long Tons)	Total Quantity	Value	% of total U. S. value
1910 -----	3,678,139	1,123,136	4,801,275	\$6,083,722	4.32
1911 -----	3,119,696	835,886	3,955,582	4,876,106	5.64
Decrease -----	558,443	287,250	845,693	1,207,616	-----
Per cent decrease	15.18	25.57	17.61	19.85	-----

In the following table the first five States in the production of iron ore are arranged according to their rank as producers in 1910 and 1911, with regard to both the quantity and the value of the ore produced:

Rank of iron-ore producing States in 1910 and 1911, with quantity and value of product and percentage of each.

1910.

Rank	State	Production		Rank	State	Value	
		Quantity, in long tons	Percentage of total product'n			Amount	Percentage of total value
1	Minnesota -----	31,966,769	56.19	1	Minnesota -----	\$78,462,560	55.75
2	Michigan -----	13,303,906	23.39	2	Michigan -----	41,393,585	29.41
3	Alabama -----	4,801,275	8.44	3	Alabama -----	6,083,722	4.32
4	New York -----	1,287,209	2.26	4	New York -----	3,848,683	2.74
5	Wisconsin -----	1,149,551	2.02	5	Wisconsin -----	3,610,349	2.57

1911.

ORE MARKETED.

1	Minnesota -----	23,398,406	57.08	1	Minnesota -----	\$48,447,760	56.06
2	Michigan -----	8,944,393	21.82	2	Michigan -----	23,808,935	27.55
3	Alabama -----	3,955,582	9.65	3	Alabama -----	4,876,106	5.64
4	New York -----	1,057,984	2.58	4	New York -----	2,959,009	3.42
5	Virginia -----	610,871	1.49	5	Wisconsin -----	1,386,616	1.60

*Kinds of Ore Produced in Alabama, and Values of same in
1910 and 1911.*

	Hematite				Brown Ore				Total		Percent of U. S. total	
	Quantity (Long Tons)	% of total State Prod.	Value	% of total State value	Quantity (Long Tons)	% of total State Prod.	Value	% of total State value	Quantity (Long Tons)	Value	Quantity	Value
1910 --	3678139	76.6	\$4376555	71.93	1123136	23.39	\$1707167	28.07	4801275	\$6083722	8.43	4.32
1911 --	3119696	78.86	3646925	74.79	835886	21.14	1229181	25.21	3955582	4876106	9.65	5.64
Deer's.	558443	---	729630	---	287250	---	477086	---	845693	1207616	---	---
Per ct..	15.18	---	16.67	---	25.57	---	27.94	---	17.61	19.85	---	---

*Iron-ore mines of Alabama that produced more than 50,000 long tons
each in 1911.*

Rank	Name of Mine	Nearest Town	Variety of Ore	Quantity
1	Woodward	Woodward	Hematite	502,471
2	Raimund, No. 1	Bessemer	Hematite	178,793
3	Songo	Birmingham	Hematite	161,912
4	Raimund, No. 2	Bessemer	Hematite	131,314
5	Ironaton	Ironaton	Brown Ore	114,360
6	Clinton	Steinman	Hematite	111,374
7	Crudup	Gadsden	Hematite	99,486
8	Raimund, No. 3	Bessemer	Hematite	84,775
9	Woodstock	Woodstock	Brown Ore	83,362
10	Etowah	Gadsden	Hematite	68,133
11	Attalla	Attalla	Hematite	65,372
Total (11 mines)				1,601,352
Unspecified* (6 mines)				1,890,209
Total of mines (23) producing less than 50,000 tons				464,021
Grand total				3,955,582

*Includes the product of 6 mines producing over 50,000 tons each, operated by 2 companies, which do not permit the publication of individual statistics.

PIG IRON AND STEEL.

THE following table gives the quantity and approximate value of the pig iron produced in the five states leading in the production of pig iron, and shows the increase or decrease, both by totals and by percentages, for 1910 and 1911.

Quantity and value of pig iron produced in the United States in 1910 and 1911, by States, in long tons.

State	1910		1911		Decrease in 1911		Perc'tage of decrease in 1911	
	Quantity	Value (Dollars)	Quantity	Value (Dollars)	Quantity	Value (Dollars)	Quantity	Value
Pennsylvania --	11,014,652	174,486,833	9,581,109	136,328,507	1,433,543	38,158,326	13.01	21.87
Ohio -----	5,584,279	85,385,254	5,371,378	73,484,592	212,901	11,900,662	3.81	13.94
Illinois -----	2,606,335	41,465,543	2,036,081	31,152,927	570,254	10,312,616	21.88	24.87
Alabama -----	1,969,770	24,127,616	1,617,150	17,379,171	352,620	6,748,445	17.90	27.97
New York -----	1,895,018	31,693,623	1,537,201	23,924,194	357,817	7,769,429	18.88	24.51

The figures above given are from the U. S. Geological Survey.

The following tables have been furnished by Mr. J. M. Swank of the American Iron and Steel Association, and Mr. Wm. G. Gray of the Bureau of Statistics of the American Iron and Steel Institute. The difference in the statistics for 1910 and 1911, are due to the fact that the figures of the U. S. Geological Survey represent shipments while the others represent the actual production.

*Production of pig iron in Alabama, 1907-1912.**J. M. Swank and Wm. G. Gray.*

Year	Coke Pig Iron Long Tons	Charcoal Pig Iron Long Tons	Total Long Tons
1907-----	1,651,533	35,141	1,686,725
1908-----	1,373,199	23,815	1,397,014
1909-----	1,729,976	33,641	1,763,617
1910-----	1,903,443	35,704	1,939,147
1911-----	1,679,654	32,557	1,712,211
1912-----	1,828,648	34,033	1,862,681

*Alabama Production of Rolled Iron and Steel (including Rolled
Forging Blooms and Rolled Forging Billets)
from 1907 to 1911, inclusive.*

J. M. Swank and Wm. G. Gray.

Year	Iron	Steel	Total
1907-----	44,728	238,569	283,297
1908-----	4,417	269,235	273,652
1909-----	1,267	256,705	257,972
1910-----	6,419	420,052	426,471
1911-----	3,550	353,059	356,609

LIME.

C. A. ABELE.

THE total production of thirteen operators in 1911 was 76,406 short tons, a decrease from 1910 of 5290 short tons, or 6.47 per cent. The value of the product was \$300,787, a decrease of \$2,825, or 0.93 per cent.

Below is a table giving the production and value of lime in 1910 and 1911, and a comparison of these years.

Production of Lime in 1910 and 1911.

	Number of Operators	Quantity Short Tons	Rank of State by quantity	Value	Rank of State by value	Average price per ton	Percentage of total U. S. value
1910 -----	14	816,96	15	\$303,612	13	\$3.72	2.19
1911 -----	13	76,406	15	300,787	16	3.94	2.19
Decrease -----		5,290		2,825			
Percentage decrease -----		6.47		0.93			

The most important use of the lime produced, as in 1910 was for building purposes, nearly 60 per cent of the total product being used for this purpose, the remainder being used in chemical plants, sugar refineries, tanneries, for fertilizer, or was distributed through dealers.

Shelby County was the largest producer, having produced 49,256 tons, or 64.46 per cent of the total. The other producers in the order of their rank were Etowah, Blount, Jackson, Calhoun and Colbert counties.

Below is an outline of some of the chemical processes in which lime may be used:

*Chemical uses of lime.**E. F. Burchard.***Agricultural industry:**

As a soil amendment, c, m.*

As an insecticide, c, m.

As a fungicide, c, m.

Bleaching industry:Manufacture of bleaching powder,
"Chloride of lime," c.Bleaching and renovating of rags,
jute, ramie, and various paper
stocks, c, m.**Caustic alkali industry:**Manufacture of soda, potash, and am-
monia, c.**Chemical industries:**

Manufacture of ammonia, c.

Manufacture of calcium carbide, cal-
cium cyanimid, and calcium ni-
trate, c.Manufacture of potassium dichromate
and sodium dichromate, c.

Manufacture of fertilizers, c, m.

Manufacture of magnesia, m.

Manufacture of acetate of lime, c.

Manufacture of wood alcohol, c.

Manufacture of bone ash, c, m.

Manufacture of calcium carbides, c.

Manufacture of calcium-light pencils,
c.

In refining mercury, c.

In dehydrating alcohol, c.

In distillation of wood, c.

Gas manufacture:Purification of coal gas and water
gas, c, m.**Glass manufacture:**

Most varieties of glass and glazes, c.

Milling industry:

Clarifying grain, c, m.

Miscellaneous manufactures:

Rubber, c, m.

Glue, c, m.

Pottery and porcelain, c, m.

Dyeing fabrics, c, m.

Polishing material, c, m.

Oil, fat, and soap manufacture:

Manufacture of soap, c.

Manufacture of glycerine, c.

Manufacture of candles, c.

Renovating fats, grease, tallow, but-
ter, c, m.Removing the acidity of oils and pe-
troleum, c, m.

Lubricating greases, c, m.

Paint and varnish manufacture:

Cold-water paint, c, m.

Refining linseed oil, c, m.

Manufacture of linoleum, c, m.

Manufacture of varnish, c, m.

Paper industry:

Soda method, c.

Sulphite method, m.

For strawboard, c, m.

As a filler, c, m.

Preserving industry:

Preserving eggs, c.

Sanitation:

As a disinfectant and deodorizer, c.

Purification of water for cities, c.

Purification of sewage, c.

Smelting industry:

Reduction of iron ores, c, m.

Sugar manufacture:

Beet root, c.

Molasses, c.

Tanning industry:

Tanning cowhides, c.

Tanning goat and kid hides, c, m.

Water softening and purifying, c.

*High calcium lime is indicated by 'c,' magnesian and dolomitic lime by 'm.'

MICA.

BY DOUGLAS B. STERRETT.

THE most prominent feature of the minerals of the mica group is their perfect cleavage into tough, flexible, and elastic sheets. The ready cleavage combined with transparency and nonconductivity of electricity render mica valuable in the industrial world. The commercial demand has practically been supplied by two varieties, muscovite and phlogopite, but a small quantity of biotite has been used. Only muscovite and phlogopite have been found in masses of sufficient size and abundance to meet the demands of the trade.

Muscovite, called "white mica," is a silicate of aluminum and potassium containing water; phlogopite, called "amber mica," is a silicate of magnesium, aluminum, and potassium; biotite is a silicate of magnesium, iron, aluminum, and potassium. Phlogopite and biotite may be placed at opposite ends of a chemical series and may grade into each other by variations in the percentage of iron present. In thin sheets muscovite is nearly colorless, phlogopite generally yellow or brownish, and biotite dark brown to black. In sheets of one-sixteenth of an inch or more in thickness muscovite may be colorless, white, gray, yellow inclining to amber, red, brown, or green; phlogopite may be yellow, brown, or black, and sometimes coppery; and biotite is black. Muscovite of a reddish color is often called "rum" and "ruby" mica. The luster of muscovite is brilliant and glimmering on fresh surfaces, and that of phlogopite is less brilliant and more silvery or pearly.

USES.

Mica has a wide commercial application, both in the form of sheet mica and of ground mica. The most extensive use of sheet mica is in the manufacture of electrical apparatus, but a considerable quantity is still used in the glazing trade for stoves, for gas-lamp chimneys, for lamp shades, etc. The demand for mica for glazing is small and only the best quality and the larger sheets are thus used. Both large and small

sheet mica is used in the electrical industry. "Micanite," or built-up mica board, for the manufacture of which small-sheet mica can be used, is substituted for large-sheet mica in much electrical work. Mica serves as a perfect insulator in various parts of dynamos, motors, induction apparatus, switchboards, lamp sockets, and nearly every variety of electrical appliance.

The domestic or muscovite mica is satisfactory for all insulation except for commutators of direct-current motors and dynamos built up of bars of copper and strips of mica. For this purpose no mica is as satisfactory as the phlogophite or "amber mica." This mica is of about the same hardness as the copper of the commutator segments and therefore wears down evenly without causing the machine to spark.

A large quantity of scrap mica—small sheets and the waste from the manufacture of sheet mica—is ground for different uses. Among these are the decoration of wall paper and the manufacture of lubricants, fancy paints, and molded mica for electrical insulation. Ground mica applied to wall papers gives them a silvery luster. When mixed with grease or oils finely ground mica forms an excellent lubricant for axles and other bearings. Mixed with shellac or special compositions ground mica is molded with desired forms and is used in insulators for trolley wires. Ground mica for electrical insulation must be free from metallic minerals. Mica used for lubrication should be free from gritty matter. For wall paper and brocade paints a ground mica with a high luster is required, and such luster is best obtained by using a clean light-colored mica and grinding it under water. Coarsely ground or "bran" mica is used to coat the surface of composition roofing material to prevent the tar or other composition used in its manufacture from sticking when the material is rolled for shipping.

From *The Mineral Resources of Alabama, 1904*, by Eugene A. Smith and Henry McCalley.

"While mica has not been sent from Alabama to the market in anything more than an experimental way, yet there is much reason for thinking that a good mercantile article can be obtained at a number of points in Chilton, Coosa, Clay and Randolph counties. In a belt of mica schists extending through these counties, there are frequent veins of a coarse grained

granite or pegmatite, in which the constituent minerals, quartz, feldspar, and mica are segregated in large masses. The feldspar is very generally weathered into kaolin, and it is from these occurrences that we get all the true or vein kaolin. The mica in its turn is present in the form generally of large rough masses or boulders, from which it may be split out in sheets of varying size. In all this belt there are ancient pits or mines in which trees are now growing with a diameter of 18 inches.

Around the mouths of these old diggings are great piles of broken-up refuse mica, apparently showing that a large amount of the mineral had been taken from them. In North Carolina, and probably elsewhere, the old mines of this kind have often proven to be the best places for obtaining good mica in modern times, and this fact may serve as a hint to those who contemplate mica mining in this State.

Most work in getting mica has probably been done near Micaville, in Cleburne county, and at the Pinetucky mine, in Randolph. Many tons of mica, some of it in large sheets six to ten inches in size, have been gotten up and stored away in a house, which was destroyed by fire and the mica injured, so that it has never been sent to market. None of the localities is near a railroad. A little testing, (it can hardly be called mining) has also been done in several places in Clay County, and also in Coosa and Chilton."

PRODUCTION.

There was only one producer of mica operating in 1911, and as this mine was opened only in the latter part of the year, the production was rather light, reaching only 65,000 pounds.

MINERAL WATERS.

G. C. MATSON.

ACCORDING to the returns received from spring owners, the mineral-water trade of Alabama continued to prosper during 1911, sales increasing from 133,159 gallons reported during 1910 to 205,854 gallons in 1911, an increase of 72,695 gallons, or 54.59 per cent. The value, however, owing to a decline of 10 cents per gallon in the average price for the year, decreased 11.94 per cent, or from \$30,639 in 1910 to \$26,982 in 1911. No new springs were reported during 1911. Two springs which failed to report in 1910 reported in 1911, and one spring reporting in 1910 was idle in 1911; hence, the total number of springs increased from 9 to 10. About three-fourths of the total sales of mineral water in Alabama is used medicinally. There are resorts at 6 of the springs, accommodating more than 700 people, and the water at 2 is said to be used for bathing purposes. In addition to the quantity reported as sold, there were 5,000 gallons used for the manufacture of soft drinks.

The following 10 springs reported sales:

Bailey Springs, Florence, Lauderdale County.

*Bladon Springs, Bladon Springs, Choctaw County.

Blount Springs, Blount Springs, Blount County.

Bromberg Gulf Coast Lithia Springs, Bayou La Batre, Mobile County.

Cherokee Spring, near Citronelle, Mobile County.

Healing Springs, Healing Springs, Washington County.

Ingram Lithia Wells, near Ohatchee, Calhoun County.

Livingston Mineral Springs, Livingston, Sumter County.

Luverne Mineral Springs, Luverne, Crenshaw County.

MacGregor Springs, Spring Hill, Mobile County.

Matchless Mineral Wells, east of Greenville, Butler County.

The following table shows the relative productions, and their respective values, for 1910 and 1911.

*The Bladon Water Co. sold mineral water from these springs in 1911, and for some years previous to this, but figures showing quantity and value of the water were not available.

Production of Mineral Waters in 1910 and 1911.

	Number of Springs	Quantity Sold	Average Retail price	Value of Medicinal Waters	Value of Table Waters	Total value of Mineral Waters	Percentage of total U. S. value
1910 -----	9	133,159	\$0.23	\$23,179	\$7,460	\$30,639	0.48
1911 -----	10	205,854	0.15	20,244	6,738	26,982	0.39
Increase or decrease--	+ 1	+ 726.95	- 0.08	- 2,935	- 722	- 3,657	-----
Per cent -----	+	54.59	- 34.68	- 12.66	- 9.69	- 11.93	-----

In the latter part of 1912 a number of owners of local mineral springs, whose production is small, and having only a limited distribution, signified a willingness to report their sales, which will probably materially increase Alabama's output in the future.

SAND AND GRAVEL.

C. A. ABELE.

THE total production of sand and gravel in the State in 1911 was 677,894 short tons, valued at \$215,413, as compared with 619,253 short tons, valued at \$187,291 in 1910, a net increase in quantity of 58,641 short tons, or 9.47 per cent, and an increase of \$27,822, or 14.83 per cent in value.

The following tables give the production, value, and disposition of the sand and gravel produced in 1910 and 1911, and a comparison of these years.

Production and Value of Sand in 1910 and 1911.

	Molding Sand		Building Sand		Paving Sand		Furnace Sand		Other Sands		Total	
	Quantity Tons	Value	Quantity Tons	Value	Quantity Tons	Value	Quantity Tons	Value	Quantity Tons	Value	Quantity Tons	Value
1910 ---	56085	\$22069	228797	\$73567	-----	-----	286	\$148	22547	\$4477	307715	\$10
1911 ---	52766	19432	201214	70284	10975	\$ 3635	36540	7738	14988	7391	356293	11
Increase												
or Decr.	- 3319	- 2637	- 27583	- 3283	-----	-----	+36254	+7590	- 7559	+ 2914	+ 48578	+ 1
Per cent	- 5.91	-11.95	- 12.05	- 4.46	-----	-----	-----	-----	-33.52	+65.08	+ 15.78	+ 1

Production of Sand and Gravel in 1910 and 1911.

	Sand		Gravel		Total		Percentage of total U. S. value
	Quant'y	Value	Quant'y	Value	Quant'y	Value	
1910 -----	307,715	\$100,261	311,538	\$87,330	619,253	\$187,591	0.89
1911 -----	356,293	119,758	321,601	95,655	677,894	215,413	1.018
Increase -----	48,578	19,497	10,063	8,325	58,641	27,822	-----
Per cent -----	15.78	19.44	3.23	9.53	9.47	14.83	-----

STONE.

E. F. BURCHARD.

THE figures presented in the following report have to do with the stone produced and sold by the quarrymen and include only such manufactured product as is put on the market by the quarrymen themselves. This applies especially to rough and dressed building stone, dressed monumental stone, crushed stone, flagstone, curbstone, and paving blocks. The value given to this manufactured product is the price received by the producer, free on board at point of shipment, and includes therefore the cost of labor necessary to dress the stone. The stone reported as sold rough includes stone sold as rough stock to monumental works, and to cut-stone contractors for building purposes; stone sold as riprap, rubble, and flux; and includes the value of only such labor as is required to get the stone out of the quarry in the shape required by the purchaser. The value given to this stone is the price received by the quarryman free on board at point of shipment. In case the stone is sold to local trade the value is given as the quarryman sells the material, generally at the quarry, but in some cases delivered, if this is done by the producer. In some instances a long haul to market or to the railroad increases the cost of the material, and therefore of the selling price.

PRODUCTION.

C. A. ABELE.

Alabama produces commercially only three kinds of stone, namely, limestone, sandstone, and marble. The most important use of the limestone is blast furnace flux, roadmaking, building and crushed stone for concrete following in the order of their importance. No sandstone for building purposes was reported in 1911, the principal use of this stone being found in the manufacture of concrete, and on dam construction on the Coosa and Tallapoosa Rivers. The value of the marble

produced may not be divulged, as there was only one producer in 1911 as in 1910.

Below is a table giving the value of the limestone and sandstone producer in the past five years, from 1907 to 1911.

Value of Stone Production from 1907 to 1911.

Kind	1907	1908	1909	1910	1911
Limestone -----	\$694,699	\$479,730	\$700,642	\$714,516	\$561,798
Sandstone -----	48,673	34,099	77,327	109,063	73,195

LIMESTONE.

The value of the limestone burned into lime, or used in the manufacture of Portland cement, is not taken into account under this heading, but is included in the value of each of the finished products in whose manufacture it is used.

As thus limited, the total value of limestone produced in 1911 was \$561,748, as compared with \$714,516 in 1910, a decrease of \$152,718, or 21.09 per cent.

The values of the limestone producer during the last five years are given below for comparison.

Production of Limestone from 1907 to 1911.

1907	1908	1909	1910	1911
\$694,699	\$479,730	\$700,642	\$714,516	\$561,798

The values of limestone produced in 1910 and 1911, classified according to the uses of the stone, are given in the following table:

Value of Limestone produced in 1910-1911.

	1910	1911	Increase or Decrease	Per cent.
Rough Building -----	\$1,901	\$2,115	+ \$214	+ 11.25
Dressed Building -----	34,001	29,652	- 4,349	- 12.79
Paving -----	4,500	170	- 4,330	- 98.00
Curbing -----		150		
Riprap -----	37,505	10,459	- 27,046	- 72.11
Road Making -----	64,872	37,511	- 27,361	- 42.17
Railroad Ballast -----	5,842			
Concrete -----	16,199	23,077	+ 6,878	+ 42.46
Flux -----	545,988	458,356	- 87,632	- 16.05
Other -----	3,708	308	- 3,400	- 91.69
Total -----	\$714,516	\$561,798	- \$152,718	- 21.09
Percentage of total U. S. value -----	2.62	1.66		

LIMESTONE FOR BUILDING PURPOSES.

EUGENE A. SMITH.

From the tables above it will be seen that by far the largest part of the limestone for other purposes than lime burning produced in Alabama 1910-1911, has been for flux rock in the iron furnaces. Crushed stone for road making and riprap follow next, and then dressed building stone.

The preparation of cut stone for building purposes in Alabama, while on the increase, is not yet what it should be. Practically all of this material comes from the quarries in the Subcarboniferous limestone of the Tennessee Valley, the most important quarries being at Rockwood in Franklin County, operated by Foster-Freighton-Gould Co., of Nashville. This stone is quite similar in appearance, composition, and other qualities to the Indiana stone, and so far as experience in the use of the stone from the two localities in the buildings of the University of Alabama goes, the Alabama stone holds its own under influence of the weather better than does the Indiana stone. Stone steps, door sills, and window sills, buttress caps, etc., of the Alabama stone put in place in 1885 show practically no deterioration in color and wear under

foot, and in crumbling and roughening under the influence of the weather, which can not be said of some portions of the Indiana stone used in buildings erected in 1909-10. The Rockwood quarries have most modern and approved methods of machinery for sawing the stone and handling it in transit to the mills and elsewhere. The stone is of massive formation, of great thickness and extent. Blocks weighing as much as 25 tons, without crack or flaw, are not infrequently quarried, the size of the blocks being practically limited only by the capacity of the hoisting machinery.

The Oolitic variety is most extensively used for building and monumental work. It is of light gray color, uniform grain, and homogeneous texture. It possesses a quality of cheapness, it can be cut to any design required, and is at the same time strong and durable.

At the present time the business at this quarry is confined to the furnishing of rough and sawed stone to the cut stone contractor or dealer.

With the installing of adequate machinery at the quarry for doing the finished work, there should never be any longer any reason for going outside of the State for this quality of stone. Already the material has been very extensively used in public buildings in Mississippi, Tennessee, as well as in Alabama. The only reason why it was not used in the recently erected buildings at the University of Alabama was that at the time these building contracts were let, the quarries furnished only the rough sawn stone and there was not in Alabama any establishment adequately equipped for the dressing of the stone in the quantity needed.

MARBLE.

EUGENE A. SMITH.

The marble of Alabama is of two kinds, crystalline or true marble and non-crystalline.

The crystalline or statuary marble occurs mainly in a narrow valley along the western border of the metamorphic area, extending from Marble Valley in Coosa County, through Talladega into Calhoun. The length of the marble belt through Coosa and Talladega counties is about 50 miles. The width of the valley carrying the marble as a rule is from one quarter to one half mile, widening in places to a mile and a quarter, for example in the neighborhood of Sylacauga.

The quarries longest known are Gantt's and Herd's near Sylacauga, Nix's near Sycamore, and Taylor's and McKenzie's near Taylor's Mill East of Talladega. From all these marble was quarried before the civil war.

During 1911 only 2 establishments had reported any marble production, viz: The Alabama Marble Co., at Gantt's Quarry near Sylacauga and the Alabama-Carara Marble Co. near Talladega. Several other companies, however, have made some rather extensive developments and will no doubt report some production in 1912 and later. These are the Eureka Marble Co. (Bishop's) near Talladega Springs; the Morretti-Harrah Marble Co., Sylacauga; and the Alabama Marble Quarries of the Scott Brothers near Sycamore.

The plant of the Alabama Marble Company at Gantt's Quarry was destroyed by fire in December, 1910, and it was not until the middle of August, 1911, that the rebuilding was completed and production begun. From that time till the end of the year the production was as stated below:

Blocks	17781 Cu. ft.
Unfinished sawed stock	7928 Cu. ft.
Finished stock of all kinds	47639 Cu. ft.
Total finished stock	73348 Cu. ft.
Scrap and broken stone	1457 tons

The cubic feet above stated are, in all cases, the net measure of the quantities sold, with all waste in quarrying, sawing, and finishing eliminated.

I think it is fairly safe to say that on the whole the marble from this quarry and immediate vicinity is of the highest grade of commercial white marble now on the market and obtainable in large quantity. There are small quantities of marble produced both in Italy and Vermont that are somewhat freer from coloring matter than the best grades that can be produced in Alabama in any quantity. But on the other hand, the poorest grades in Alabama greatly surpass the poorest grades produced elsewhere, so that the average of the Alabama deposit is probably somewhat higher than that of any other so far developed, not excluding even the marble from the Carara district in Italy. The marble from this State (Gantt's Quarry) has now a well established reputation and has been used in more than 150 important buildings throughout the United States.

It can be seen in the galleries of the National Museum in Washington.

A beautiful quality of variegated limestone or marble—red, pink and white—belonging probably to the Cambrian formation, occurs in Shelby County a mile or two south of Shelby Springs station on the L. & N. railroad, and extending thence southwest for a mile or two. Nothing but prospecting work has been done on this marble. The Trenton limestone in the Appalachian valleys, particularly Jones Valley below Bessemer, contains marble similar to that quarried in the vicinity of Knoxville, Tenn. Also at Pratt's ferry on the Cahaba River in Bibb County a quarry was for many years worked in this formation and turned out a very beautiful quality of marble varying in color from gray through pink, red, and brown shades.

A black marble which is exceedingly promising, has been reported and some development work done near Anniston, Calhoun County, and some very handsome specimens of cave onyx have been obtained from near Kymulga in Talladega County.

In the Coastal Plain the St. Stephens limestone of the Tertiary holds ledges of hard, almost crystalline rock capable of taking good polish. The colors vary from nearly white, through shades of yellowish into red, and it would make a handsome decorative marble, especially for inside work.

Other limestone formations, such as the Subcarboniferous and the Knox Dolomite, could in places be drawn upon for marble.

SANDSTONE.

The value and distribution of the sandstone produced in 1911, with a comparison of 1910 and 1911, is given in the table below:

Value and Uses of Sandstone Produced in 1910 and 1911.

	Rough Building	Ganister	Rubble	Riprap	Crushed Stone for Concrete	Total	% of total U. S. value
1911 -----		12,700	14,362	16,133	30,000	73,195	.94
1910 -----	\$100	\$12,088	\$20,802	\$20,073	\$56,000	\$100,063	1.37
Increase or decrease -----	+	612	6,440	3,940	26,000	53,868	-----
Per cent -----	+	5.06	30.96	14.64	46.42	32.88	-----

SUMMARY OF THE MINERAL PRODUCTION OF
ALABAMA IN 1911.

ON account of the different units of measurement employed in the mineral industry, a summation of the production of the year can include only values of the products. It is also to be noticed that a simple summation of all the values of the minerals, or mineral products listed in this pamphlet would give a value somewhat in excess of the true value, since in many cases, as for instance, coal and coke, the second product is directly a product of the first. To give the values of both as a part of the total would be to repeat, in a measure, a partial value of the first or raw product, and would give an erroneous result.

According to this manner of summation, 1907 was the first and only year in which the value of the Alabama production reached or passed the \$50,000,000 mark. The result of the financial depression of 1907 is apparent in the decrease in value of the mineral products of 1908, which declined \$17,125,941, or approximately 32 per cent from the 1907 value. In 1909 and 1910 the general recovery in business increased the total values to \$41,982,208, and \$47,751,109 respectively. In 1911 the decline in pig iron and the decreased coal production brought the total value of the year down to \$40,203,712, a decrease of \$7,547,397, or 15.6 per cent.

In 1911 coal took the lead as the most valuable product, the others being, in the order of the value, pig iron, brick and tile, limestone, cement, sand and gravel, sandstone, bauxite, pottery, and miscellaneous, including marble, graphite, gold and silver, mica, natural gas, and abrasives.

The following table shows how the total value of the mineral products of the state varied during the last five years:

*The total value of the Mineral Products of Alabama from
1907 to 1911.*

Year	Value	% of total U. S. value
1907.....	\$52,136,749	2.51
1908.....	35,010,808	2.19
1909.....	41,982,208	2.22
1910.....	47,751,109	2.39
1911.....	40,203,712	2.09

PROBABLE FUTURE PRODUCTION.

THE following minerals have been produced in Alabama in past years, but no production was reported for 1911: Fullers Earth, Manganese ore, Ocher, Pyrite. Since all these occur in quantity and of quality to make them of commercial value, the production may be resumed at any time.

Among the probable productions in the near future, are natural gas and petroleum, onyx marble, turquoise and other minerals noticed in the Index to the Mineral Resources of Alabama a publication of the State Geological Survey.

Natural gas under pressure of 630 pounds has been obtained from several wells in Fayette and Walker Counties, and smaller quantities under less pressure have been obtained near Huntsville and elsewhere.

A Report with map on the Fayette County Gas Field has been published by the survey during the year. No commercial production has yet been reported.

Year	Value	Year	Value
1907	\$1,100,000	1910	\$1,100,000
1908	\$1,100,000	1911	\$1,100,000
1909	\$1,100,000	1912	\$1,100,000
1910	\$1,100,000	1913	\$1,100,000
1911	\$1,100,000	1914	\$1,100,000
1912	\$1,100,000	1915	\$1,100,000
1913	\$1,100,000	1916	\$1,100,000
1914	\$1,100,000	1917	\$1,100,000
1915	\$1,100,000	1918	\$1,100,000
1916	\$1,100,000	1919	\$1,100,000
1917	\$1,100,000	1920	\$1,100,000
1918	\$1,100,000	1921	\$1,100,000
1919	\$1,100,000	1922	\$1,100,000
1920	\$1,100,000	1923	\$1,100,000
1921	\$1,100,000	1924	\$1,100,000
1922	\$1,100,000	1925	\$1,100,000
1923	\$1,100,000	1926	\$1,100,000
1924	\$1,100,000	1927	\$1,100,000
1925	\$1,100,000	1928	\$1,100,000
1926	\$1,100,000	1929	\$1,100,000
1927	\$1,100,000	1930	\$1,100,000
1928	\$1,100,000	1931	\$1,100,000
1929	\$1,100,000	1932	\$1,100,000
1930	\$1,100,000	1933	\$1,100,000
1931	\$1,100,000	1934	\$1,100,000
1932	\$1,100,000	1935	\$1,100,000
1933	\$1,100,000	1936	\$1,100,000
1934	\$1,100,000	1937	\$1,100,000
1935	\$1,100,000	1938	\$1,100,000
1936	\$1,100,000	1939	\$1,100,000
1937	\$1,100,000	1940	\$1,100,000
1938	\$1,100,000	1941	\$1,100,000
1939	\$1,100,000	1942	\$1,100,000
1940	\$1,100,000	1943	\$1,100,000
1941	\$1,100,000	1944	\$1,100,000
1942	\$1,100,000	1945	\$1,100,000
1943	\$1,100,000	1946	\$1,100,000
1944	\$1,100,000	1947	\$1,100,000
1945	\$1,100,000	1948	\$1,100,000
1946	\$1,100,000	1949	\$1,100,000
1947	\$1,100,000	1950	\$1,100,000
1948	\$1,100,000	1951	\$1,100,000
1949	\$1,100,000	1952	\$1,100,000
1950	\$1,100,000	1953	\$1,100,000
1951	\$1,100,000	1954	\$1,100,000
1952	\$1,100,000	1955	\$1,100,000
1953	\$1,100,000	1956	\$1,100,000
1954	\$1,100,000	1957	\$1,100,000
1955	\$1,100,000	1958	\$1,100,000
1956	\$1,100,000	1959	\$1,100,000
1957	\$1,100,000	1960	\$1,100,000
1958	\$1,100,000	1961	\$1,100,000
1959	\$1,100,000	1962	\$1,100,000
1960	\$1,100,000	1963	\$1,100,000
1961	\$1,100,000	1964	\$1,100,000
1962	\$1,100,000	1965	\$1,100,000
1963	\$1,100,000	1966	\$1,100,000
1964	\$1,100,000	1967	\$1,100,000
1965	\$1,100,000	1968	\$1,100,000
1966	\$1,100,000	1969	\$1,100,000
1967	\$1,100,000	1970	\$1,100,000
1968	\$1,100,000	1971	\$1,100,000
1969	\$1,100,000	1972	\$1,100,000
1970	\$1,100,000	1973	\$1,100,000
1971	\$1,100,000	1974	\$1,100,000
1972	\$1,100,000	1975	\$1,100,000
1973	\$1,100,000	1976	\$1,100,000
1974	\$1,100,000	1977	\$1,100,000
1975	\$1,100,000	1978	\$1,100,000
1976	\$1,100,000	1979	\$1,100,000
1977	\$1,100,000	1980	\$1,100,000
1978	\$1,100,000	1981	\$1,100,000
1979	\$1,100,000	1982	\$1,100,000
1980	\$1,100,000	1983	\$1,100,000
1981	\$1,100,000	1984	\$1,100,000
1982	\$1,100,000	1985	\$1,100,000
1983	\$1,100,000	1986	\$1,100,000
1984	\$1,100,000	1987	\$1,100,000
1985	\$1,100,000	1988	\$1,100,000
1986	\$1,100,000	1989	\$1,100,000
1987	\$1,100,000	1990	\$1,100,000
1988	\$1,100,000	1991	\$1,100,000
1989	\$1,100,000	1992	\$1,100,000
1990	\$1,100,000	1993	\$1,100,000
1991	\$1,100,000	1994	\$1,100,000
1992	\$1,100,000	1995	\$1,100,000
1993	\$1,100,000	1996	\$1,100,000
1994	\$1,100,000	1997	\$1,100,000
1995	\$1,100,000	1998	\$1,100,000
1996	\$1,100,000	1999	\$1,100,000
1997	\$1,100,000	2000	\$1,100,000
1998	\$1,100,000	2001	\$1,100,000
1999	\$1,100,000	2002	\$1,100,000
2000	\$1,100,000	2003	\$1,100,000
2001	\$1,100,000	2004	\$1,100,000
2002	\$1,100,000	2005	\$1,100,000
2003	\$1,100,000	2006	\$1,100,000
2004	\$1,100,000	2007	\$1,100,000
2005	\$1,100,000	2008	\$1,100,000
2006	\$1,100,000	2009	\$1,100,000
2007	\$1,100,000	2010	\$1,100,000
2008	\$1,100,000	2011	\$1,100,000
2009	\$1,100,000	2012	\$1,100,000
2010	\$1,100,000	2013	\$1,100,000
2011	\$1,100,000	2014	\$1,100,000
2012	\$1,100,000	2015	\$1,100,000
2013	\$1,100,000	2016	\$1,100,000
2014	\$1,100,000	2017	\$1,100,000
2015	\$1,100,000	2018	\$1,100,000
2016	\$1,100,000	2019	\$1,100,000
2017	\$1,100,000	2020	\$1,100,000
2018	\$1,100,000	2021	\$1,100,000
2019	\$1,100,000	2022	\$1,100,000
2020	\$1,100,000	2023	\$1,100,000
2021	\$1,100,000	2024	\$1,100,000
2022	\$1,100,000	2025	\$1,100,000
2023	\$1,100,000	2026	\$1,100,000
2024	\$1,100,000	2027	\$1,100,000
2025	\$1,100,000	2028	\$1,100,000
2026	\$1,100,000	2029	\$1,100,000
2027	\$1,100,000	2030	\$1,100,000
2028	\$1,100,000	2031	\$1,100,000
2029	\$1,100,000	2032	\$1,100,000
2030	\$1,100,000	2033	\$1,100,000
2031	\$1,100,000	2034	\$1,100,000
2032	\$1,100,000	2035	\$1,100,000
2033	\$1,100,000	2036	\$1,100,000
2034	\$1,100,000	2037	\$1,100,000
2035	\$1,100,000	2038	\$1,100,000
2036	\$1,100,000	2039	\$1,100,000
2037	\$1,100,000	2040	\$1,100,000
2038	\$1,100,000	2041	\$1,100,000
2039	\$1,100,000	2042	\$1,100,000
2040	\$1,100,000	2043	\$1,100,000
2041	\$1,100,000	2044	\$1,100,000
2042	\$1,100,000	2045	\$1,100,000
2043	\$1,100,000	2046	\$1,100,000
2044	\$1,100,000	2047	\$1,100,000
2045	\$1,100,000	2048	\$1,100,000
2046	\$1,100,000	2049	\$1,100,000
2047	\$1,100,000	2050	\$1,100,000
2048	\$1,100,000	2051	\$1,100,000
2049	\$1,100,000	2052	\$1,100,000
2050	\$1,100,000	2053	\$1,100,000
2051	\$1,100,000	2054	\$1,100,000
2052	\$1,100,000	2055	\$1,100,000
2053	\$1,100,000	2056	\$1,100,000
2054	\$1,100,000	2057	\$1,100,000
2055	\$1,100,000	2058	\$1,100,000
2056	\$1,100,000	2059	\$1,100,000
2057	\$1,100,000	2060	\$1,100,000
2058	\$1,100,000	2061	\$1,100,000
2059	\$1,100,000	2062	\$1,100,000
2060	\$1,100,000	2063	\$1,100,000
2061	\$1,100,000	2064	\$1,100,000
2062	\$1,100,000	2065	\$1,100,000
2063	\$1,100,000	2066	\$1,100,000
2064	\$1,100,000	2067	\$1,100,000
2065	\$1,100,000	2068	\$1,100,000
2066	\$1,100,000	2069	\$1,100,000
2067	\$1,100,000	2070	\$1,100,000
2068	\$1,100,000	2071	\$1,100,000
2069	\$1,100,000	2072	\$1,100,000
2070	\$1,100,000	2073	\$1,100,000
2071	\$1,100,000	2074	\$1,100,000
2072	\$1,100,000	2075	\$1,100,000
2073	\$1,100,000	2076	\$1,100,000
2074	\$1,100,000	2077	\$1,100,000
2075	\$1,100,000	2078	\$1,100,000
2076	\$1,100,000	2079	\$1,100,000
2077	\$1,100,000	2080	\$1,100,000
2078	\$1,100,000	2081	\$1,100,000
2079	\$1,100,000	2082	\$1,100,000
2080	\$1,100,000	2083	\$1,100,000
2081	\$1,100,000	2084	\$1,100,000
2082	\$1,100,000	2085	\$1,100,000
2083	\$1,100,000	2086	\$1,100,000
2084	\$1,100,000	2087	\$1,100,000
2085	\$1,100,000	2088	\$1,100,000
2086	\$1,100,000	2089	\$1,100,000
2087	\$1,100,000	2090	\$1,100,000
2088	\$1,100,000	2091	\$1,100,000
2089	\$1,100,000	2092	\$1,100,000
2090	\$1,100,000	2093	\$1,100,000
2091	\$1,100,000	2094	\$1,100,000
2092	\$1,100,000	2095	\$1,100,000
2093	\$1,100,000	2096	\$1,100,000
2094	\$1,100,000	2097	\$1,100,000
2095	\$1,100,000	2098	\$1,100,000
2096	\$1,100,000	2099	\$1,100,000
2097	\$1,100,000	2100	\$1,100,000

